DOCUMENT 000101 - PROJECT TITLE PAGE

PROJECT MANUAL

Title: Police Station Addition to the Caseyville Village Hall

Location: Village of Caseyville
Caseyville, IL 62232

Architect Project No.: 20018

Issued: 09/18/2023

ISSUED FOR BID

END OF DOCUMENT 000101

aaic
established 1963
architects interiors planners
AAIC inc.
One Design Mesa
Collinsville, Illinois
62234
p 618.345.1270
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AAIC Inc.
One Design Mesa
Collinsville, Illinois 62234
618-345-1270

PROJECT MANUAL FOR**:** POLICE STATION ADDITION TO THE CASEYVILLE VILLAGE HALL
Village of Caseyville, IL
909 S. Main St., Caseyville, IL 62232

DATE:

END OF TOC

SECTION 000107 - SEALS PAGE

PART 1 - Seals Page

1.1 DESIGN PROFESSIONALS OF RECORD

A. Architect:

1. Name: Calvin C. Morris
2. Seal Number: 001.010501
3. Firm Registration: 184.000463-0001
4. Responsible for Divisions 01-14 Sections except as indicated prepared by other design professionals of record.

B. Civil Engineer:

1. Name: David B. Claxton P.E.
2. Seal Number: 062-049684
3. Firm Registration: # 184.004638-0010

C. Structural Engineer:

1. Name: Chad Schrand
2. Seal Number: 081.006430
3. Firm Registration:184.007637-0014
4. Responsible for Sections 03 30 00, 04 22 00, 05 12 23, 05 31 00, 05 40 00, 05 50 00, 06 10 00, 06 17 53,

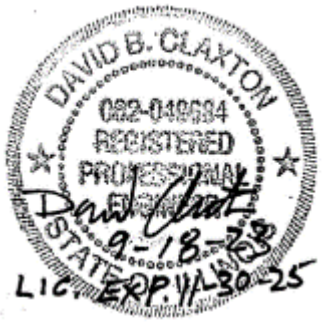
D. Fire-Protection, Plumbing, and Mechanical Engineer:

1. Name: Matthew J. Kahn P.E.
2. Seal Number:062-065586
3. Firm Registration: 184.007637-0014
4. Responsible for Division 21, 22, and 23.

E. Electrical Engineer:

1. Name: Marc T. Harris P.E.
2. Seal Number:062-069056
3. Firm Registration: 184.007637-0014
4. Responsible for Division 26, 27, and 28.

END OF SECTION 000107



Lic. Exp. 11-30-2024

Lic. Exp. 11-30-2023 Lic. Exp. 11-30-2023

Lic. Exp. 11-30-2024

DOCUMENT 000115 - LIST OF DRAWING SHEETS

GENERAL:

G101	Project Cover Sheet
G102	Code Compliance Information

CIVIL:

C-1	General Notes
C-2	Demolition Plan
C-3	Site Plan
C-4	Utility Plan
C-5	Parking Layout and Striping Plan
C-6	Grading, Erosion, and Stormwater Pollution Prevention Plan (SWWPPP)
C-7	Storm Sewer Profiles
C-8	Storm Sewer Profiles
C-9	Notes, Details, Specifications

ARCHITECTURAL:

AD101	Village Hall Demolition Plan
AD102	Village Hall Reflected Ceiling Demolition Plan
AD103	Village Hall Roof Demolition Plan
AD301	Village Hall Demolition Building Section and Interior Elevations
A001	Architectural Site Plan
A002	Enlarged Site Details
A101	Police Addition Annotation Plan
A102A	Village Hall Annotation Plan
A102B	Police Addition Annotation Plan
A103A	Village Hall Reflected Ceiling Plan
A103B	Police Addition Reflected Ceiling Plan
A104	Roof Plan
A110	Enlarged Canopy Roof Plan, Elevations, and Details
A201	Exterior Elevations
A301	Building Sections
A401	Wall Sections
A402	Wall Sections
A501	Police Addition Enlarged Plans and Interior Elevations
A601	Casework and Miscellaneous Details
A602	Casework and Miscellaneous Details
A603	Detention Casework and Miscellaneous Details
A701	Enlarged Plan and Section Details
A702	Enlarged Plan and Section Details
A703	Enlarged Section Details
A704	Enlarged Roof Details
A801	Door Schedule, Types, and Frames
A802	Door Details
A803	Detention Door Details

A804	Storefront, Window, Sections, and Details
A901	Room Finish Schedule and Plan – Police Station
A902	Room Finish Schedule and Plan – Village Hall
A903	Partition Types, Room Finish Details, and Specs

STRUCTURAL:

S000	Cover Sheet
S001	General Notes
S002	General Notes
S003	Inspection Schedules
S004	Inspection Schedules
S200	First Floor/Foundation Plan – Area B
S201	Ceiling Plan – Area B
S202	Roof Framing Plan – Area B
S203	Village Hall Foundation Plan
S204	Village Hall Framing Plan
S205	Canopy Framing Plan
S206	Exterior Elevations
S300	Typical Concrete Details
S301	Typical Concrete Details
S400	Typical Masonry Details
S401	Typical Masonry Details
S500	Typical Steel Details
S600	Typical Wood Details
S601	Truss Elevation
S700	General Sections
S701	General Sections
S702	General Sections
S703	General Sections

FIRE PROTECTION:

FP000	Fire Protection Cover Sheet
FP101	Level 01 Village Hall Plan – Fire Protection Demolition
FP102	Level 01 Police Station Plan – Fire Protection
FP202	Level 01 Village Hall Plan – Fire Protection
FP203	Attic Police Station Plan – Fire Protection
FP400	Fire Protection Details
FP600	Fire Protection Schedules

PLUMBING:

P000	Plumbing Cover Sheet
P200	Underfloor Police Station Plan – Plumbing
P201	Level 01 Police Station Plan – Plumbing
P203	Roof Police Station Plan – Plumbing
P300	Plumbing Enlarged Plan
P400	Plumbing Details
P500	Plumbing Diagrams

P501 Plumbing Diagrams
P600 Plumbing Schedules
P601 Plumbing Schedules

VENTILATION:

V000 Ventilation Cover Sheet
V101 Level 01 Village Hall Plan – Ventilation Demolition
V201 Level 01 Police Station Plan – Ventilation
V202 Level 01 Village Hall Plan – Ventilation
V203 Attic Police Station Plan – Ventilation
V204 Roof Police Station Plan – Ventilation
V400 Ventilation Details
V401 Ventilation Details
V500 Ventilation Diagrams
V501 Ventilation Diagrams
V502 Ventilation Diagrams
V600 Ventilation Schedules
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ELECTRICAL:

E000 Electrical Cover Sheet
E002 Electrical Cover Sheet
E003 Electrical Systems Cover Sheet
E101 Level 01 Village Hall Plan – Electrical Demolition
E200 Site Plan – Electrical
E201 Level 01 Police Station Plan – Lighting
E202 Level 01 Village Hall Plan – Lighting
E211 Level 01 Police Station Plan – Power
E212 Level 01 Village Hall Plan – Power
E221 Level 01 Police Station Plan – Systems
E222 Level 01 Village Hall Plan – Systems
E400 Electrical Details
E401 Electrical Details
E500 Electrical Diagrams
E600 Electrical Schedules
E601 Electrical Schedules
E602 Electrical Schedules
E603 Electrical Schedules

TECHNOLOGY:

T000 Technology Cover Sheet
T101 Level 01 Village Hall Plan – Technology Demolition
T200 Site Plan – Technology
T201 Level 01 Police Station Plan – Technology
T202 Level 01 Village Hall Plan – Technology
T300 Technology Enlarged Plans
T400 Technology Details

T401	Technology Details
T500	Technology Diagrams
T600	Technology Schedules
T601	Security Schedules

PHOTOVOLTAIC:

PV000	Electrical Photovoltaic Cover Sheet
PV200	Roof Police Station Plan – Photovoltaic
PV500	Electrical Photovoltaic Diagrams

END OF DOCUMENT 000115

SECTION 00 11 13 - ADVERTISEMENT FOR BIDS

PART 1 - ADVERTISEMENT FOR BIDS

1.1 PROJECT INFORMATION

A. Notice to Bidders: Qualified bidders may submit bids for project as described in this Document. Submit bids according to the Instructions to Bidders.

1. Regulatory Requirements: The State of Illinois shall govern submittal, opening, and award of bids.

B. Project Identification: Police Station Addition to the Caseyville Village Hall

1. Project Location: 909 S. Main Street, Caseyville, IL 62232

C. Owner: Village of Caseyville

1. Owner's Representative: Brian Rader, Director of Public Works

D. Architect: AAIC Inc. (618) 345-1270

E. Project Description: The construction of a New Caseyville Police Station connected to the existing Village Hall and renovations to the existing Village Hall.

F. Construction Contracts: Bids will be received for the following Work:

1. Bid Package 01 – SITE

2. Bid Package 02 – BUILDING SHELL

3. Bid Package 03 – INTERIOR

4. Bid Package 04 – FIRE SUPPRESSION

5. Bid Package 05 – PLUMBING

6. Bid Package 06 – MECHANICAL

7. Bid Package 07 - ELECTRICAL

1.2 BID SUBMITTAL AND OPENING

A. Owner will receive sealed lump sum bids until the bid time and date at the location given below. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by Owner, and delivered as follows:

1. Bid Date:
   a. Bid Packages 01, 02, and 03 = October 18, 2023

b. Bid Packages 04, 05, 06, and 07 = October 19, 2023

2. Bid Time: 2:00 p.m., local time.
3. Location: Caseyville Village Hall, 909 S. Main Street, Caseyville, IL 62232.

B. Bids will thereafter be publicly opened and read aloud.

1.3 BID SECURITY

A. Bid security shall be submitted with each bid in the amount of 5 percent of the bid amount. No bids may be withdrawn for a period of 60 days after opening of bids. Owner reserves the right to reject any and all bids and to waive informalities and irregularities.

1.4 PREBID MEETING

A. Prebid Meeting: See Document 00 25 13 "Prebid Meetings."

B. Non-Mandatory Prebid Meeting: A Prebid meeting for all bidders will be held at Caseyville Village Hall, 909 S. Main Street, Caseyville, IL 62232, on October 3, 2023, at 1:00 p.m., local time. Prospective bidders, subcontractors, and suppliers are recommended to attend.

1. Bidders' Questions: Architect will provide responses at Prebid conference to bidders' questions received up to two business days prior to conference.

2. Question deadline is 10:00 a.m., October 11, 2023.

1.5 DOCUMENTS

A. Digital Procurement and Contracting Documents: Send request via email to contact@aaicinc.com to be placed on official plan holders list and to receive digital copies of documents.

B. Printed Procurement and Contracting Documents: Can be purchased by contacting Snow Printing, (618) 233-0712. Only complete sets of documents will be issued.

C. Viewing Procurement and Contracting Documents at the locations below:

1. SIBA (Southern Illinois Builders Association) O'Fallon, Illinois.
2. Construction Marketing Data

1.6 TIME OF COMPLETION

A. Successful bidder shall begin the Work on receipt of the Notice to Proceed and shall complete the Work within the Contract Time based upon construction schedule in section 01 10 00 “Project Summary – Bid Packages / Schedule”.

1.7 BIDDER'S QUALIFICATIONS

A. Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work. A Performance Bond, separate Labor and Material Payment Bond, and Insurance in a form acceptable to Owner will be required of the successful Bidder.

1.8 PROJECT LABOR AGREEMENT

A. Execution of a Project Labor Agreement is required by successful contractor. Letter of Assent will be required by all contractors and subcontracts on site. Prime contractor letter of assent is **required with bid submission.**

1.9 PREVAILING WAGE

1.10 ILLINOIS PROVISIONS

1.11 BEP PARTICIPATION

1.12 INSURANCE REQUIREMENTS

A. All Bid Package Contractors are responsible for insurance requirements in section 00 73 00. Including general liability and contractor provided builders risk / property insurance policies.

1.13 PERFORMANCE AND PAYMENT BONDS

A. All Bid Package Contractors will supply performance and payment bonds for duration of project.

1.14 NOTIFICATION

A. This Advertisement for Bids document is issued by AAIC Inc., Architect.

END OF SECTION 00 11 13

AIA® Document A701™ – 2018

Instructions to Bidders

for the following Project:
(Name, location, and detailed description)

Police Station Addition to the Caseyville Village Hall
909 S. Main Street
Caseyville, IL 62232

THE OWNER:
(Name, legal status, address, and other information)

Village of Caseyville
909 S. Main Street
Caseyville, IL 62232

THE ARCHITECT:
(Name, legal status, address, and other information)

AAIC inc.
One Design Mesa
Collinsville, IL 62234

TABLE OF ARTICLES

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- **.1** the Bidder has read and understands the Bidding Documents;
- **.2** the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- **.3** the Bid complies with the Bidding Documents;
- **.4** the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- **.5** the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- **.6** the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:
(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:
(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

- **.1** a designation of the Work to be performed with the Bidder's own forces;
- **.2** names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
- **.3** names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.
(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds
§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[ ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Calvin C. Morris, AIA, NCARB; Principal-In-Charge, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 15:08:14 ET on 02/04/2022 under Order No. 6936309273 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A701™ – 2018, Instructions to Bidders, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

SECTION 00 22 13 - SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

PART 1 - Supplementary Instructions to Bidders

1.1 INSTRUCTIONS TO BIDDERS

A. Instructions to Bidders for Project consist of the following:

1. AIA Document A701, "Instructions to Bidders," a copy of which is bound in this Project Manual.
2. The following Supplementary Instructions to Bidders that modify and add to the requirements of the Instructions to Bidders.

1.2 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS, GENERAL

A. The following supplements modify AIA Document A701, "Instructions to Bidders." Where a portion of the Instructions to Bidders is modified or deleted by these Supplementary Instructions to Bidders, unaltered portions of the Instructions to Bidders shall remain in effect.

1.3 ARTICLE 2 - BIDDER'S REPRESENTATIONS

A. Add Section 2.1.3.1:

1. 2.1.3.1 - The Bidder has investigated all required fees, permits, and regulatory requirements of authorities having jurisdiction and has properly included in the submitted bid the cost of such fees, permits, and requirements not otherwise indicated as provided by Owner.

B. Add Section 2.1.5:

1. 2.1.5 - The Bidder is a properly licensed Contractor according to the laws and regulations of the state of Illinois and county of Madison and meets qualifications indicated in the Procurement and Contracting Documents.

C. Add Section 2.1.6:

1. 2.1.6 - The Bidder has incorporated into the Bid adequate sums for work performed by installers whose qualifications meet those indicated in the Procurement and Contracting Documents.

1.4 ARTICLE 3 - BIDDING DOCUMENTS

A. 3.2 - Interpretation or Correction of Procurement and Contracting Documents:

1. Add Section 3.2.2.1:

a. 3.2.2.1 - Submit Bidder's Requests for Interpretation using form bound in the Project Manual.

B. 3.4 - Addenda:

1. Delete Section 3.4.3 and replace with the following:

a. 3.4.3 - Addenda may be issued at any time prior to the receipt of bids.

2. Add Section 3.4.4.1:

a. 3.4.4.1 - Owner may elect to waive the requirement for acknowledging receipt of 3.4.4 Addenda as follows:

1) 3.4.4.1.1 - Information received as part of the Bid indicates that the Bid, as submitted, reflects modifications to the Procurement and Contracting Documents included in an unacknowledged Addendum.
2) 3.4.4.1.2 - Modifications to the Procurement and Contracting Documents in an unacknowledged Addendum do not, in the opinion of Owner, affect the Contract Sum or Contract Time.

1.5 ARTICLE 4 - BIDDING PROCEDURES

A. 4.1 - Preparation of Bids:

1. Add Section 4.1.1.1:

a. 4.1.1.1 - Printable electronic Bid Forms and related documents are available from Architect.

2. Add Section 4.1.8:

a. 4.1.8 - The Bid shall include unit prices when called for by the Procurement and Contracting Documents. Owner will not consider unit prices in the determination of award. Unit prices will be incorporated into the Contract.

3. Add Section 4.1.9:

a. 4.1.9 - Owner may elect to disqualify a bid due to failure to submit a bid in the form requested, failure to bid requested alternates or unit prices, failure to complete entries in all blanks in the Bid Form, or inclusion by the Bidder of any alternates, conditions, limitations or provisions not called for.

B. 4.3 - Submission of Bids:

1. Add Section 4.3.1.2:

a. 4.3.1.2 - Include Bidder's Contractor License Number applicable in Project jurisdiction on the face of the sealed bid envelope.

C. 4.4 - Modification or Withdrawal of Bids:

1. Add the following sections to 4.4.2:

    a. 4.4.2.1 - Such modifications to or withdrawal of a bid may only be made by persons authorized to act on behalf of the Bidder. Authorized persons are those so identified in the Bidder's corporate bylaws, specifically empowered by the Bidder's charter or similar legally binding document acceptable to Owner, or by a power of attorney, signed and dated, describing the scope and limitations of the power of attorney. Make such documentation available to Owner at the time of seeking modifications or withdrawal of the Bid.

    b. 4.4.2.2 - Owner will consider modifications to a bid written on the sealed bid envelope by authorized persons when such modifications comply with the following: the modification is indicated by a percent or stated amount to be added to or deducted from the Bid; the amount of the Bid itself is not made known by the modification; a signature of the authorized person, along with the time and date of the modification, accompanies the modification. Completion of an unsealed bid form, awaiting final figures from the Bidder, does not require power of attorney due to the evidenced authorization of the Bidder implied by the circumstance of the completion and delivery of the Bid.

2.

D. 4.5 - Break-Out Pricing Bid Supplement:

1. Add Section 4.5:

    a. 4.5 - Provide detailed cost breakdowns on forms provided no later than two business days following Architect's request.

E. 4.6 - Subcontractors, Suppliers, and Manufacturers List Bid Supplement:

1. Add Section 4.6:

    a. 4.6 - Provide list of major subcontractors, suppliers, and manufacturers furnishing or installing products on forms provided no later than two business days following Architect's request. Include those subcontractors, suppliers, and manufacturers providing work totaling three percent or more of the Bid amount. Do not change subcontractors, suppliers, and manufacturers from those submitted without approval of Architect.

1.6 ARTICLE 5 - CONSIDERATION OF BIDS

A. 5.2 - Rejection of Bids:

1. Add Section 5.2.1:

    a. 5.2.1 - Owner reserves the right to reject a bid based on Owner's and Architect's evaluation of qualification information submitted following opening of bids. Owner's evaluation of the Bidder's qualifications will include: status of licensure and record of compliance with licensing requirements, record of quality of completed work, record of Project

completion and ability to complete, record of financial management including financial resources available to complete Project and record of timely payment of obligations, record of Project site management including compliance with requirements of authorities having jurisdiction, record of and number of current claims and disputes and the status of their resolution, and qualifications of the Bidder's proposed Project staff and proposed subcontractors.

1.7 ARTICLE 6 - POSTBID INFORMATION

A. 6.1 - Contractor's Qualification Statement:

1. Add Section 6.1.1:

a. 6.1.1 - Submit Contractor's Qualification Statement no later than two business days following Architect's request.

B. 6.3 - Submittals:

1. Add Section 6.3.1.4:

a. 6.3.1.4 - Submit information requested in Sections 6.3.1.1, 6.3.1.2, and 6.3.1.3 no later than two business days following Architect's request.

1.8 ARTICLE 7 - PERFORMANCE BOND AND PAYMENT BOND

A. 7.1 - Bond Requirements:

1. Add Section 7.1.1.1:

a. 7.1.1.1 - Both a Performance Bond and a Payment Bond will be required, each in an amount equal to 100 percent of the Contract Sum.

B. 7.2 - Time of Delivery and Form of Bonds:

1. Delete the first sentence of Section 7.2.1 and insert the following:

The Bidder shall deliver the required bonds to Owner no later than 10 days after the date of Notice of Intent to Award and no later than the date of execution of the Contract, whichever occurs first. Owner may deem the failure of the Bidder to deliver required bonds within the period of time allowed a default.

2. Delete Section 7.2.3 and insert the following:

a. 7.2.3 - Bonds shall be executed and be in force on the date of the execution of the Contract.

1.9 ARTICLE 8 - FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

A. AIA Owner-Contractor Agreement.

1.10 ARTICLE 9 - EXECUTION OF THE CONTRACT

A. Add Article 9:

1. 9.1.1 - Subsequent to the Notice of Intent to Award, and within 10 days after the prescribed Form of Agreement is presented to the Awardee for signature, the Awardee shall execute and deliver the Agreement to Owner through Architect, in such number of counterparts as Owner may require.
2. 9.1.2 - Owner may deem as a default the failure of the Awardee to execute the Contract and to supply the required bonds when the Agreement is presented for signature within the period of time allowed.
3. 9.1.3 - Unless otherwise indicated in the Procurement and Contracting Documents or the executed Agreement, the date of commencement of the Work shall be the date of the executed Agreement.
4. 9.1.4 - In the event of a default, Owner may declare the amount of the Bid security forfeited and elect to either award the Contract to the next responsible bidder or re-advertise for bids.

END OF SECTION 00 22 13

SECTION 00 25 13 - PREBID MEETINGS

PART 1 - Prebid Meetings

1.1 PREBID MEETING

A. Architect will conduct a Prebid meeting as indicated below:

1. Meeting Date: October 3, 2023
2. Meeting Time: 1:00 pm, local time.
3. Location: Caseyville Village Hall, 909 S. Main Street, Caseyville, IL 62232.

B. Attendance:

1. Bidders: Attendance at Prebid meeting is recommended.
2. Subcontractor(s): Attendance at Prebid meeting is recommended.

C. Bidder Questions: Submit written questions to be addressed at Prebid meeting minimum of two business days prior to meeting.

D. Agenda: Prebid meeting agenda will include review of topics that may affect proper preparation and submittal of bids, including the following:

1. Procurement and Contracting Requirements:

a. Advertisement for Bids.
b. Instructions to Bidders.
c. Bidder Qualifications.
d. Bonding.
e. Insurance.
f. Bid Security.
g. Bid Form and Attachments.
h. Bid Submittal Requirements.
i. Bid Submittal Checklist.
    1) Bid Form
    2) Bid Bond
    3) PLA Letter of Assent
j. Project Labor Agreement
k. Prevailing Wage
l. BEP Participation
m. IL Apprenticeship Program
n. Notice of Award.

2. Communication during Bidding Period:

a. Obtaining documents.
b. Bidder's Requests for Information.
c. Bidder's Substitution Request/Prior Approval Request.

d. Addenda.

3. Contracting Requirements:

   a. Agreement.
   b. The General Conditions.
   c. The Supplementary Conditions.
   d. Other Owner requirements.

4. Construction Documents:

   a. Scopes of Work.
   b. Temporary Facilities.
   c. Use of Site.
   d. Work Restrictions.
   e. Allowances.
   f. Substitutions following award.

5. Separate Contracts:

   a. Work by Owner.
   b. Work of Other Contracts.
   c. Bid Package 01 – Site
   d. Bid Package 02 – Building Shell
   e. Bid Package 03 – Interior
   f. Bid Package 04 – Fire Suppression
   g. Bid Package 05 – Plumbing
   h. Bid Package 06 – Mechanical
   i. Bid Package 07 - Electrical

6. Schedule:

   a. Project Schedule.
   b. Contract Time.
   c. Other Bidder Questions.

7. Site/facility visit or walkthrough.
8. Post-Meeting Addendum.

E. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes to attendees and others known by the issuing office to have received a complete set of Procurement and Contracting Documents. Minutes of meeting are issued as Available Information and do not constitute a modification to the Procurement and Contracting Documents. Modifications to the Procurement and Contracting Documents are issued by written Addendum only.

   1. Sign-in Sheet: Minutes will include list of meeting attendees.
   2. List of Planholders: Minutes will include list of planholders.

END OF SECTION 00 25 13

SECTION 00 26 00 - PROCUREMENT SUBSTITUTION PROCEDURES

PART 1 - Procurement Substitution Procedures

1.1 DEFINITIONS

A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.

B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 012500 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

1.2 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.3 PROCUREMENT SUBSTITUTIONS

A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.

B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:

1. Extensive revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
3. The request is fully documented and properly submitted.

1.4 SUBMITTALS

A. Procurement Substitution Request: Submit to Architect. Procurement Substitution Request must be made in writing by prime contract Bidder only in compliance with the following requirements:

1. Requests for substitution of materials and equipment will be considered if received no later than 10 days prior to date of bid opening.
2. Submittal Format: Submit two copies of each written Procurement Substitution Request, using form bound in Project Manual.
3. Submittal Format: Submit Procurement Substitution Request, using format provided on Project Web site.

    a. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specifications Sections and drawing numbers.
    b. Provide complete documentation on both the product specified and the proposed substitute, including the following information as appropriate:

        1) Point-by-point comparison of specified and proposed substitute product data, fabrication drawings, and installation procedures.
        2) Copies of current, independent third-party test data of salient product or system characteristics.
        3) Samples where applicable or when requested by Architect.
        4) Detailed comparison of significant qualities of the proposed substitute with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
        5) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
        6) Research reports, where applicable, evidencing compliance with building code in effect for Project.
        7) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractor(s), which will become necessary to accommodate the proposed substitute.

    c. Provide certification by manufacturer that the substitute proposed is equal to or superior to that required by the Procurement and Contracting Documents, and that its in-place performance will be equal to or superior to the product or equipment specified in the application indicated.
    d. Bidder, in submitting the Procurement Substitution Request, waives the right to additional payment or an extension of Contract Time because of the failure of the substitute to perform as represented in the Procurement Substitution Request.

B. Architect's Action:

1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

C. Architect's approval of a substitute during bidding does not relieve Contractor(s) of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF SECTION 00 26 00

SECTION 00 31 32 - GEOTECHNICAL DATA

PART 1 - Geotechnical Data

1.1 GEOTECHNICAL DATA

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information but are not a warranty of existing conditions.

B. A geotechnical services report for Project, prepared by Quality Testing and Engineering, Inc, dated March 27, 2023, is appended to this Document.

C. Related Requirements:

1. Document 00 21 13 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
2. Document 00 31 19 "Existing Condition Information" for information about existing conditions that is made available to bidders.

END OF SECTION 00 31 32

QUALITY TESTING AND ENGINEERING, INC.

GEOTECHNICAL

ENVIRONMENTAL

CONSTRUCTION MATERIAL TESTING

CULTURAL RESOURCES

NATURAL RESOURCES

AASHTO R18
AASHTO Accredited

Subsurface Exploration
and
Geotechnical Recommendations

NEW CASEYVILLE POLICE STATION
CASEYVILLE, ILLINOIS

March 27, 2023

Village of Caseyville
Owner

AAIC, Inc.
Architect

Project No. 23-0079-G

CORPORATE OFFICE: 803 WEST STATE STREET, O'FALLON, IL 62269 PHONE: 618-632-9900 FAX: 618-632-9922
REGIONAL OFFICE: 206 SOUTH LINN AVENUE, WENTZVILLE, MO 63385 PHONE: 636-332-1153 FAX: 636-332-5781
WWW.QTEINC.COM

QUALITY TESTING AND ENGINEERING, INC.

GEOTECHNICAL

ENVIRONMENTAL

CONSTRUCTION MATERIAL TESTING

CULTURAL RESOURCES

NATURAL RESOURCES

March 27, 2023

Mr. Chad Morris, LEED BD&C
AAIC, Inc.
One Design Mesa
Collinsville, Illinois 62234

RE: Geotechnical Services Report
New Caseyville Police Station
Caseyville, Illinois
QTE No. 23-0079-G

Dear Mr. Morris:

Enclosed is our Geotechnical Report titled *Subsurface Exploration and Geotechnical Recommendations – NEW CASEYVILLE POLICE STATION,* dated March 27, 2023. The report provided herein should be read in its entirety for a full understanding of the report highlights provided below and other project recommendations. Highlights from the report include:

- Low plastic clay and silt fill soils were encountered near soil subgrade elevations to depths of approximately 3.0 to 5.5 feet on the site. These fill soils where tested, appear suitable for structural support. We recommend the subgrade of the fill materials be checked by QTE during construction.

- High plastic clay soils were encountered near the existing surface. However, planned new fill of four to five feet should keep slabs and bearing elements far enough away from the potentially swelting soil.

- Shallow foundations bearing in low plastic fill soils or newly placed low plastic fill are appropriate for support of the proposed improvements. Detailed recommendations for bearing pressures are further discussed in this report.

- A review of the Illinois State Geological Survey coal mine map indicates that the site is adjacent to a documented subterranean mine. Additional information is provided in the attached report.

- A soil profile coefficient is required for the calculation of minimum earthquake design forces. The coefficient is a function of the depth of soil and the soil type. Based on the encountered soil conditions, the site may be classified as being Seismic Site Class D.

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AASHTO Accredited

Mr. Chad Morris
AAIC, Inc.

March 27, 2023
QTE No. 23-0079-G

We appreciate the opportunity to be of service to you on this project. We should be employed to provide quality control testing for the project as recommended in the report. If you have any questions or comments at this time regarding the report or additional services, please call.

Respectfully submitted,

QUALITY TESTING AND ENGINEERING, INC.

Michael A. Widman, P.E.
President

MAW/sb

One hard copy and one electronic copy submitted.

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QUALITY TESTING AND ENGINEERING, INC.

Subsurface Exploration
and
Geotechnical Recommendations

NEW CASEYVILLE POLICE STATION
CASEYVILLE, ILLINOIS

1.0 INTRODUCTION

We were authorized by Mr. Chad Morris of AAIC, Inc., to conduct a subsurface exploration and to provide geotechnical recommendations for the proposed new police station in Caseyville, Illinois. The purpose of our exploration was to characterize and evaluate the subsurface conditions in order to develop geotechnical recommendations for the project, and to prepare a formal report. The general scope of our study as outlined in our proposal dated February 20, 2023, addressed the following:

- Location and general description of natural soils and existing fill materials, if encountered.
- Groundwater levels observed in the borings at the time of drilling, and the potential influence of groundwater on the design and construction of the project.
- Review of public information regarding existence of subterranean coal mines.
- Evaluation of volume change potential of subgrade soils and recommendations for mitigation of high plastic soils, if necessary.
- Recommendations for foundation design, including feasible foundation types, bearing depths, allowable bearing pressures, and allowable friction values, as applicable.
- Anticipated settlement of shallow foundations, if recommended, based on general soil characteristics.
- Seismic Site Class, mapped spectral accelerations at 0.2 second and 1.0 second (S_s and S_1), and Design Spectral Accelerations at 0.2 second and 1.0 second (S_{DS} and S_{D1}) according to the current adopted International Building Code for the project and criteria established by ASCE 7 for Seismic Site Class C or D.
- Recommendations for floor slab design, including modulus of subgrade reaction.
- Site development recommendations and construction considerations.
- Suitability of on-site soils for use as structural fill.
- Engineering criteria for placement of structural fill.
- Pavement subgrade considerations.

- Suggested construction monitoring program for foundation construction.

1.1 Site Description

QTE understands that the site is located at 909 South Main Street in Caseyville, Illinois. Currently, the site is the City Hall, and the addition will be on the existing northwest corner of the building and reaching out into the existing parking lot. The site slopes from near the building, towards the northwest with about 4 feet of relief.

1.2 Project Description

The proposed new, single-story, slab-on-grade addition will require fills on the order of approximately 5 to 6 feet may be required to achieve final design grades. QTE anticipates that the structure will be lightly loaded, with column loads of less than 80 kips and wall loads of less than 4 kips per lineal foot.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

The field exploration phase of the project consisted of drilling six (6) soil borings, designated as B-1 through B-6, to termination depths from 5 to 20 feet beneath the existing ground surface. The boring locations were selected by AAIC, Inc, on a provided plan and staked in the` field by QTE personnel by measuring from existing site and topographic features.

Field sampling and testing consisted of performing standard penetration tests (SPTs) with a split-spoon sampler at 2½-foot vertical intervals to a depth of 10 feet, and at 5-foot intervals thereafter. The SPT provides approximate soil strength information and a disturbed sample for routine laboratory testing. Materials recovered with the split-spoon sampler were placed in sealed glass jars. Additionally, relatively undisturbed samples were recovered at selected locations by pushing 3-inch-diameter thin-walled sampling tubes (Shelby tube) in lieu of the SPTs.

The samples were transported to our laboratory for classification and testing. QTE visually classified each cohesive soil sample and measured its moisture content. Approximations of the unconfined compressive strength of the cohesive SPT samples were determined by hand penetrometer. Fill soil density tests and unconfined compression tests were performed on the relatively undisturbed sample recovered in a Shelby tube. Laboratory test results are presented on the Boring Logs in Appendix A.

3.0 SUBSURFACE CONDITIONS

The following is a general description of the soils encountered at the six completed soil boring locations. Detailed information regarding the soils encountered is presented on the Boring Logs. A Boring Log Legend is included to clarify the data presented.

3.1 Fill Materials

Fill materials consisting of low and plastic silty clay and silt soils, were found in both additions and parking areas. The fill was approximately 3.0 to 5.5 feet in thickness. The standard penetration test N-values of the fill materials ranged from 6 blows per foot (bpf) to 39 bpf and the moisture contents ranged from 18 to 23 percent. One shelby tube sample was collected in lieu of the SPT sample where a dry density of 89.2 pounds per cubic foot (pcf) with unconfined compressive strength of 1.73 ksf.

The fill was apparently placed during building construction and general grading for the original site. The results of the testing on the fill soils indicate they are very firm to stiff in consistency and likely have been placed in a controlled manner. These soils, upon further approval by QTE during construction, are considered suitable for structural support.

3.2 Natural Soils

The natural soils encountered on the site generally consisted of most low plastic silty clays, limited high plastic clay and an isolated sand layer, to termination depths. The soils encountered were generally soft to medium stiff in consistency with SPT N-values ranging from 5 to 13 blows per foot (bpf), averaging 8 bpf. Moisture contents ranged from 22 to 35 percent, with unconfined compressive strengths as measured with a hand penetrometer ranging from approximately 1.0 to 5.0 kips per square foot (ksf). The sand layer was loose in density with an SPT N-value of 7 bpf.

To further characterize the fill soils, an Atterberg limits test was performed on a select sample. This sample exhibited a liquid limit of 39, with corresponding plasticity index of 12. The result of the Atterberg limit test indicate that the silt soils have a low potential for volume change with variations in the moisture content.

3.3 Groundwater

Groundwater was observed in all of the deeper borings and ranged from 13 to 18.5 feet beneath the existing ground surface at the time of drilling. No groundwater was observed in the drive lane borings. Groundwater is not anticipated to be encountered in the footing excavations. However, groundwater may be encountered in deeper utility excavations during wetter times of the year.

3.4 Subterranean Mine Research

A review of the Illinois State Geological Survey (ISGS) map titled "Coal Mines in Illinois Monks Mound Quadrangle, Madison & St. Clair Counties, Illinois" dated June 21, 2001 and revised January 27, 2005, indicates that the site is adjacent to a mapped mine and depicted on the attached *Figure 2 – Mine Map*. Based upon the geologic setting of the site, and our knowledge of the area, it is our opinion that the site could be undermined.

4.0 GEOTECHNICAL DESIGN CONSIDERATIONS

Newly placed fill should be of materials approved and monitored during placement by QTE. The following design recommendations assume the site has been prepared in accordance with the recommendations presented in subsequent sections of this report.

4.1 Existing Fill

The fill was apparently placed during grading for the original city hall and site general grading from the phase of construction. The results of the testing on the fill soils indicate they are firm to very stiff in consistency and have been placed in a controlled manner. These soils, upon further approval by QTE during construction, are considered suitable for structural support. The low plasticity fill possesses little potential for volume change with changes in the soil moisture content.

4.2 Shallow Foundations

Based on the soils encountered during the exploration, shallow foundations are considered appropriate for the proposed new structures. The shallow foundations bearing on natural, low plastic soil, existing fill (areas proofrolled and accepted) or in newly placed structural fill may be proportioned for a maximum net allowable bearing pressure of 2,000 pounds per square foot (psf). Exterior footings for the buildings should be provided with a minimum of 30 inches of cover for frost considerations. Interior footings in heated areas of the buildings may be placed at nominal depths below the floor slabs. Some softer soils may be encountered in some of the footing excavations and may require some isolated removal and replacement.

We recommend the foundation walls be reinforced with at least three No. 4 bars, continuous, top and bottom. The foundation wall reinforcement will assist in bridging any soft, disturbed areas or "hard" spots in the footing subgrade and assist in distributing heave pressure exerted by underlying soils. The structural design of the foundation walls may require heavier reinforcement. The final designs by the project architect and/or structural engineer may supersede these general recommendations.

Based on the anticipated structural loads, total post-construction settlement of the proposed structures should be on the order of 1-inch or less. This settlement should occur in a relatively uniform manner over the footprint of the structures. Maximum differential settlement between adjacent column supports may be estimated to be approximately half of the total settlement. Most of the settlement should occur during construction as the structural loads are applied to the subgrade. If the structures will not tolerate these magnitudes of settlement, more stringent site development procedures can be implemented that would create building pads with less potential for settlement.

4.3 High Plastic Clay Soil Considerations

The encountered on-site high plastic clay soils encountered on the site possess a moderate to high potential for volume change with variations in moisture. These high plastic clays were near the surface. We understand the site will receive 4 to 5 feet of new fill to meet design grades. If needed during grading, or if construction elevation changes from original assumptions, we recommend keeping untreated high plastic clays a minimum of one and a half feet beneath floor slab and footing subgrade elevations. High plastic clay soils can swell with increases in moisture contents and shrink when subjected to reduction in moisture contents. These changes can result in footing, floor slab, and pavements heaving and settling, which can ultimately lead to cracking in the footings, floor slabs, and pavements, and can also result in differential settlements. High plastic clay soils may be encountered beneath the footings and the floor slab, and beneath the pavements in areas not explored across the site.

If in question during design or during grading, QTE should be retained during grading to determine if high plastic clay soils will be present within 18 inches of the final bearing elevation of the footings and 18 inches for floor slabs, or within 12 inches of the pavement subgrades. Should high plastic clay soils be encountered in within those depths, they should be remediated as discussed herein. This procedure will create a zone of materials beneath structural elements with little or no potential for volume change. Different remediation options are further discussed below.

Chemical treatment of high plastic soils with "Code-L" below the pavements is a possible alternative to removal and replacement. An incorporation rate of 2.5 to 3.5 percent "Code L" Lime should suffice for remediation. As an alternative, Quick Lime could be utilized at a rate of 1.5 to 2.5 percent. The incorporation rates are based on dry weight of materials. Incorporation of lime in each lift of fill requires achieving a uniform blend of the materials by use of large, mechanized equipment or "gators." Use of farm discs is not considered acceptable for blending lime based on prior experience with such equipment. With any method of remediation, excessive drying of high plastic soils in both the foundation and floor slab excavations should be avoided. The potential for plastic soil heave-related distress increases with the reduction of natural moisture content.

Where interior utility trenches extend deeper than the remediated soils, considerations should be given to using relatively impermeable bedding and backfill material. Lean concrete or compacted low plastic soil would be ideal. Crushed stone with fines may be used provided it is properly compacted. Clean crushed limestone should generally not be used as bedding or backfill for below-grade utilities on this project due to the potential migration of water and the sensitivity of the underlying high plastic clay soils. The project

civil engineer should review the proposed elevations for utility trenches and specify proper materials for bedding and backfill.

The recommendations and construction procedures provided above for remediation of the on-site high plastic clay soils have proven effective and have generally been accepted by the engineering community. It should be noted, however, that variations in these soils occur from site to site, or on one specific site, and swell pressures beyond those anticipated may occur due to changes in natural moisture content, natural dry density, clay mineralogy, or from other occurrences. There is, therefore, an inherent risk for construction on these materials that must be accepted by the project owner. Additional laboratory tests may be conducted by QTE to define the risk more clearly.

4.4 Floor Slabs

The recommendations provided below are intended as minimum requirements and are not intended to supersede the structural engineering design of the floor slabs. QTE should observe and approve the subgrade immediately prior to placement of the floor slabs. Tests may be required to verify proper compaction of the subgrade materials if they are disturbed after initial placement and testing. For a properly proofrolled low-plastic soil subgrade, a modulus of subgrade reaction of 100 pounds per cubic inch (pci) may be used for slab design. This value may be increased to 150 pci if lime-modified soils or if granular materials are used. In order to achieve the above values, the subgrade, rock base, and backfill materials must be placed and compacted as recommended herein.

The floor slabs should be supported on a minimum 4-inch-thick layer of compacted crushed stone. The crushed stone will help distribute concentrated loads and equalize moisture conditions beneath the slabs. It may be desirable to place a polyethylene moisture barrier beneath the floor slabs to prevent the transfer of capillary moisture to the slab. If a moisture barrier is needed, we recommend American Concrete Institute (ACI) 302 standard be referenced. We suggest the applicable recommendations provided in the standards of ACI be followed for curing the concrete floor slab. Without careful attention to curing of the concrete slabs, however, the polyethylene sheet can cause excessive shrinkage cracking and "curling."

We suggest floor slabs not be structurally connected to the foundation walls and column pads. Isolation joints should be used at any place where a slab meets a wall or an independent column support. Careful attention should be given to the control joint spacing intervals which will likely be dictated by the design thickness of the slabs. Such joints permit slight movement of the independent elements and help prevent random cracking that might otherwise be caused by restraint of shrinkage, slight rotations, heave, or settlement. If the floor slabs must be structurally tied or connected to the foundations, slotted nut-type

inserts should be considered for the fasteners. This type of fastener will allow minor vertical movement yet, provide lateral resistance.

4.5 Seismic Considerations

According to ground motion maps prepared by the USGS and data obtained from the 2015 International Building Code (which the City of Caseyville has adopted), and criteria established in ASCE 7-10, the seismic parameters detailed in Table 4.1 should apply for the site.

Table 4.1 - Seismic Design Parameters

Parameter	Value
Occupancy Category	I, II or III
Spectral Accelerations at 0.2 sec (S_S)	0.45
Spectral Acceleration at 1.0 sec. (S_1)	0.17
Design Spectral Accelerations at 0.2 sec (S_{DS})	0.558
Design Spectral Acceleration at 1.0 sec. (S_{D1})	0.373
Seismic Site Class	D
Seismic Design Category	D

4.6 Site Drainage and Grading

Site drainage should be provided to reduce infiltration of surface water into the backfill of the foundations and beneath the floor slabs. All grades should be sloped away from the building. Roof and surface drainage should be collected and diverted through underground or aboveground non-perforated pipe to discharge away from the foundation wall backfill. Particular attention should be given to drainage in lawn or planting areas if proposed adjacent to the building. The subgrade in paved areas should be sloped to collection points or trenches.

4.7 Foundation Subdrains

We recommend the installation of an exterior foundation subdrain system to intercept groundwater that might otherwise infiltrate the zones beneath the footings and floor slabs and reduce the development of hydrostatic pressures around the footings, if needed. The subdrains should consist of 4-inch diameter, perforated plastic pipe laid with the holes down and surrounded with a select filter stone material consisting of ½- to 1-inch clean crushed stone. This stone should be isolated from the surrounding subgrade with a single layer of synthetic filter material such as Supac 4NP, Mirafi 140N, or equivalent. Dimensional "Form-A-Drain," or equivalent, could also be considered. If needed, the perimeter subdrains should be

placed at the base of footing elevation and drained by gravity to daylight or connected to an interior sump where positive drainage by gravity cannot be achieved.

5.0 CONSTRUCTION RECOMMENDATIONS AND CONSIDERATIONS

The geotechnical aspects of the proposed construction will involve site preparation, grading of the building pads and pavement areas, placement of footings and foundations, floor slab construction, and pavement construction. QTE should be involved in these construction activities.

5.1 Site Preparation

Prior to fill placement and general grading activities, the site should be stripped of any topsoil, trees, vegetation, pavements, subbase rock, and existing utilities. Organic soils other than surficial topsoil were not observed near the surface at the boring locations; however, if such materials are encountered, they should be stripped and stockpiled for later use in landscaped areas. If soft and or organic soils are encountered, they should be completely removed and replaced with approved structural fill as described in this report.

After removal of vegetation and completion of any required additional stripping, the subgrade in areas to receive fill should be scarified and recompacted to a dry density of at least 95 percent of the material's maximum dry density as determined by the standard Proctor compaction test (ASTM D 698). Exposed soils in proposed cut areas should be observed by personnel of QTE and identified as acceptable or not acceptable for placement as structural fill in the building and parking areas.

5.2 Fill Materials and Compaction

A clean, low plastic, cohesive borrow material, may be used as site fill. Typically, these soils are classified by ASTM D 2487 as CL, ML, or CL/ML, and have a liquid limit of less than 45. If fill materials are imported, they should be approved at their origin before being transported to the site. The near surface on-site soils that are low plastic in nature are considered acceptable for placement as fill. If high plastic clay soils are to be used as fill (footing excavation spoils), they should be remediated with Code-L lime if used within the building footprint or beneath the proposed pavements. QTE should observe, test, and approve soils used as structural fill.

If construction occurs during wet weather, the existing cohesive soil subgrade and fill materials may require chemical modification to reduce natural moisture contents and achieve compaction. An incorporation rate of 1 to 2 percent "Code L" *should suffice for moisture control.* Incorporation of lime in each lift of fill requires achieving a uniform, full-depth blend of the materials by use of large, mechanized equipment or "gators." Incorporation of lime in each lift of fill requires achieving a uniform, full-depth blend of the

materials by use of large, mechanized equipment or "gators." Use of farm discs is not considered acceptable for blending lime based on prior experience with such equipment. The incorporation rates are based on dry weight of materials. For blending activities, we recommend the materials be uniformly blended, placed and compacted in accordance with our recommendations and the National Lime Association Guidelines for the upcoming projects. Additional water is typically required for proper hydration when using chemicals for drying and may result in a slight volumetric gain when utilizing chemical admixtures at higher dosage rates.

Low plastic, cohesive fill should be placed in 8- to 12-inch loose lifts and compacted to a dry density of at least 95 percent of the material's standard Proctor maximum dry density. In general, the moisture content of the fill should be within 3 percent of optimum. Tests should be performed on each lift of fill and on every other lift of backfill to ensure compliance with the compaction requirements.

Granular materials classified as GP or GW may be preferable for structural fill and backfill and may be cost effective if the importation of fill materials is required. Granular materials will provide an excellent working surface for construction of buildings, will not be adversely affected by inclement weather, and can generally be compacted more readily. Agricultural grade limestone, limestone screenings, and recycled concrete are not considered adequate for structural fill beneath the proposed structures and pavements. We suggest using ¾-inch to 1-inch-minus gradation crushed limestone, placed and compacted in the same manner and to the same criteria as recommended above for low plastic soil. Finer granular materials, such as limestone screenings, or materials classified as SP or SW are not generally recommended as they can be difficult to work with and achieve design compaction requirements and stability.

5.3 Floor Slab Subgrade Considerations

The soil subgrade may be subjected to construction traffic and exposure to weather for an extended period prior to pouring the concrete slab. It is essential, therefore, to compact the subgrade to a dry density of at least 95 percent of the standard Proctor maximum dry density immediately prior to placing the slab. This recommendation applies to both cut and fill areas.

During an extended period of hot and/or dry weather, an effort should be made to prevent exposed floor slab subgrades from drying out. Precautions might include spreading a thin layer of limestone screenings over the subgrade to prevent direct exposure to the air and sunlight. Significant construction problems may also be incurred if floor slab construction takes place in the wetter portions of the year, usually November through April. Special measures may be required to facilitate construction during these periods. These measures may include, but are not limited to, addition of lime to the subgrade soils for drying purposes, or

the removal of soft, spongy soils, and their replacement with rock. QTE should test the soil subgrade to verify proper compaction before rock is placed.

5.4 Wall Backfill and Compaction

The backfill for the foundation walls should consist of low plastic soils or granular material. High plastic clay soils should not be used for backfill unless chemically stabilized. We suggest using granular material to provide improved drainage and to reduce lateral pressures on walls. If soil backfill is used, however, we recommend placement in 8-inch loose lifts and mechanically compacting to at least 92 percent of the standard Proctor maximum dry density. The compaction requirement should be increased to 95 percent where the backfill is to support the adjacent first floor slabs, walks, or pavements. We advise performing field density tests on at least every other lift to monitor compliance with this standard.

Granular backfill should consist of ¾- to 1-inch-minus crushed limestone, placed in the same manner and to the same degree of compaction as described above. As an alternate, ½- to 1-inch-clean crushed limestone may be placed as backfill, though typically not recommended. If clean rock is used, it should be placed in no more than 2-foot-thick lifts and tamped or tracked to achieve adequate densification. Because of the potential risk of migration of soil fines into the clean rock, a synthetic filter fabric should be placed between the soil face of the excavation and the clean rock backfill.

5.5 Foundation Excavations

Each footing excavation should terminate in firm, low plastic, approved bearing materials. QTE should observe the initial footing excavations to establish acceptable criteria for footing placement. Footing and foundation excavations should not be left open longer than necessary to reduce drying of the soils in the exposed excavations.

The base of all excavations should be clean, dry, and free of loose or uncompacted fill. The excavations should be protected from extreme temperatures, precipitation, and construction disturbances. To minimize the possibility of disturbance of the foundation materials, we recommend the concrete be placed the same day the excavation is made.

5.6 Excavation Safety Considerations

During the excavation of this project, it may be necessary to slope or temporarily shore walls of open excavations to prevent collapse and sloughing of the soils. OSHA mandates that all excavations, whether they are utility trenches, basement excavations, or footing excavations, be constructed in accordance with OSHA guidelines.

5.7 Pavement Subgrade Considerations

For a subgrade consisting of low plastic soils or granular materials, we recommend the subgrade materials be compacted to a dry density of at least 95 percent of the standard Proctor maximum dry density. Tests should be performed to verify compliance with compaction requirements.

Before placing the base course, the subgrade should be proofrolled to determine if any localized soft areas have developed. Proofrolling consists of oriented passes of a heavily-loaded rubber-tired vehicle such as a dump truck. Proofrolling is an economical means of locating soft soils that contribute to the deterioration of pavements. If the subgrade soils "pump" under the trafficking of the construction equipment, the soils should be allowed to aerate and be recompacted before final grading and placement of the pavement section.

The granular base course for the pavement section should be compacted to 95 percent of the above criterion. Tests should be performed to verify compliance with this requirement. The base course and the asphaltic concrete pavement section should be monitored for proper thickness and tested for compaction during placement rather than by coring after placement. Verification by coring after placement does not allow for corrective measures during construction if project specifications are not being met. Portland cement concrete paving, if chosen, should also be monitored, and tested during placement. Concrete pavement should be considered at all high intensity stress areas, such as dumpster pads and entry areas. Drainage of the base course should be provided at low points in the parking areas and drive lanes by placing weep holes in storm drainage structures, which will likely be required at these locations.

6.0 CONSTRUCTION MONITORING PROGRAM

The following section details suggestions for a construction monitoring program. This summary of services is recommended to provide quality assurance in assessing design assumptions and to document earth-related construction procedures for compliance with plans, specifications, and good engineering practice. We suggest that Quality Testing and Engineering, Inc. perform the following project related services:

- Review plans to assess the suitability and the proper application of the geotechnical recommendations provided herein.
- Observe site preparation, determine the suitability of exposed subgrade soils, and determine if materials in cut portions of the site are suitable for use as structural fill.
- Evaluate proposed borrow materials. One standard Proctor test and Atterberg limits test should be performed on each material at the start of grading, and then one per week or whenever materials appear to change.
- Monitor fill placement during site development. Moisture control testing and compaction testing is typically performed by a qualified soil technician at a rate of one test per lift per 10,000 square

feet. The same interval would apply during preparation of the pavement subgrade and the compacted rock base.

- Observe foundation excavations prior to the installation of rebar to determine if conditions are suitable. The observation is normally done daily while on site performing other construction related services.

- Monitor placement of reinforcing steel and concrete in shallow foundations, slabs, walls, and pavements (where applicable). Steel placement is typically observed prior to a concrete pour to allow for corrections, if required. The American Concrete Institute and the Portland Cement Association recommend minimum concrete sampling to consist of 5 cylinders with slump, temperature, and air content testing to be performed once daily for each class of concrete and once for every 100 to 150 cubic yards of each class of concrete placed per day. Batch plant inspections can be performed as requested or as required by job specifications.

- Monitor pavement subgrade preparation and subsequent construction.

7.0 LIMITATIONS OF REPORT

The recommendations provided herein are for the exclusive use of AAIC, Inc. Our recommendations are based on the information obtained at the completed six, widely-spaced, borings in the project area, on our understanding of the project scope as described herein, and on regionally accepted practice. No other warranty is expressed or implied. We should be contacted if there are changes in the scope of the project as reported herein, if conditions encountered are not consistent with those described, or if our present understanding of the project is incorrect.

In addition, we should be provided with a set of final plans as soon as they are available for review to determine the applicability of our recommendations. Construction specifications also merit our review to ensure proper interpretation of this report. Failure to provide these documents for review may nullify some or all of the recommendations provided herein.

The final part of our geotechnical service should consist of observation and materials testing during construction to observe that conditions actually encountered are consistent with those described in this report and to assess the appropriateness of the analyses and the recommendations contained herein. QTE cannot assume responsibility or liability for the adequacy of its recommendations without being retained to observe construction.

FIGURES

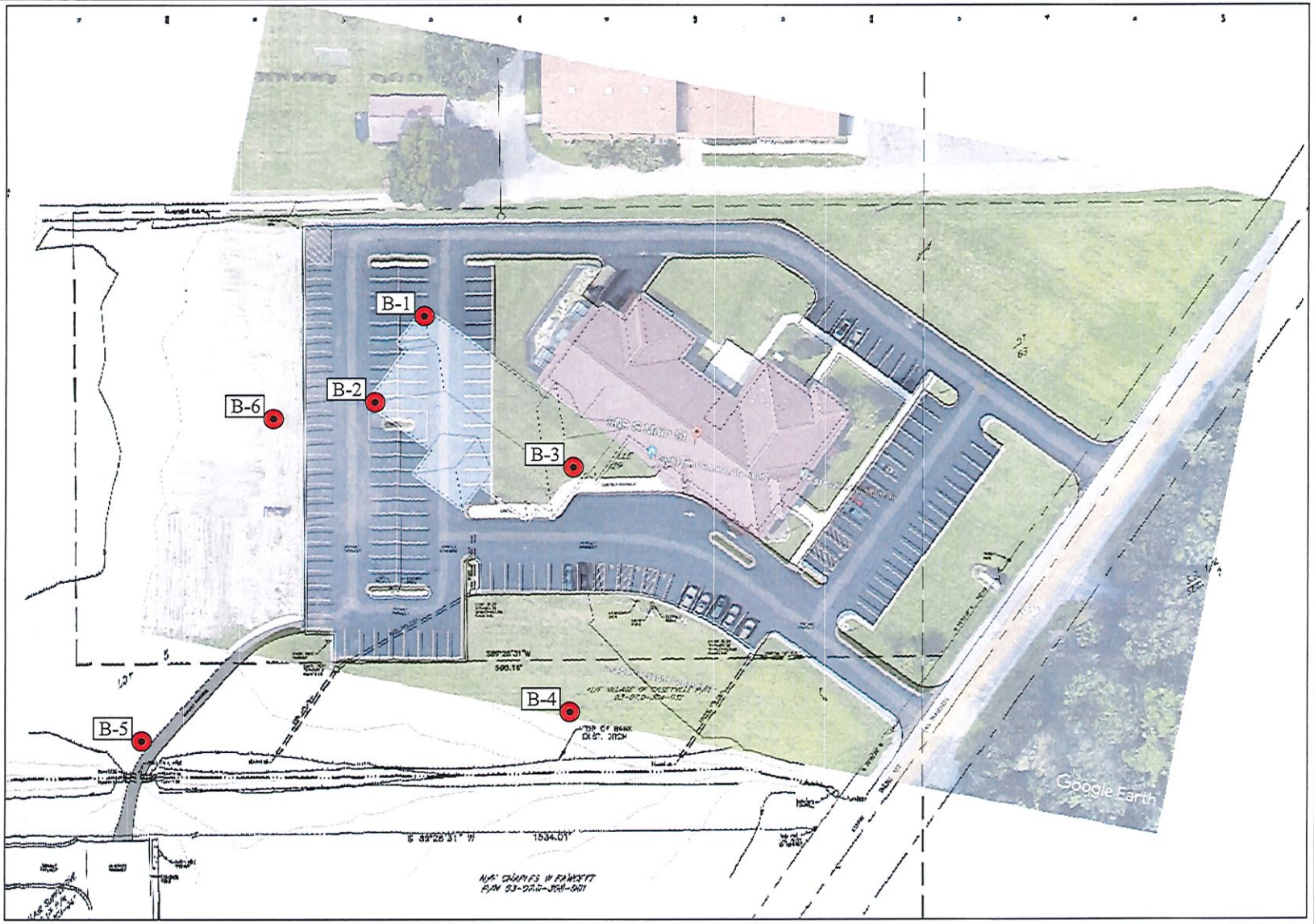

FIGURE 1

● = APPROXIMATE BORING LOCATION

BASED ON OBSERVATIONS MADE BY THE STAFF OF QUALITY TESTING AND ENGINEERING, INC.
DIMENSIONS AND LOCATIONS ARE APPROXIMATE ACTUAL MAY VARY.
DRAWING NOT INTENDED FOR USE OTHER THAN AS PART OF THE REPORT FOR WHICH IT WAS CREATED.

QUALITY TESTING AND ENGINEERING, INC.
803 WEST STATE STREET, O'FALLON, IL. 62269
PHONE: 618-632-9900 FAX: 618-632-9922 EMAIL: QTE@QTEINC.COM

NEW CASEYVILLE POLICE STATION
Caseyville, Illinois

SITE PLAN

MARCH 2023 PROJECT NO. 23-0079-G

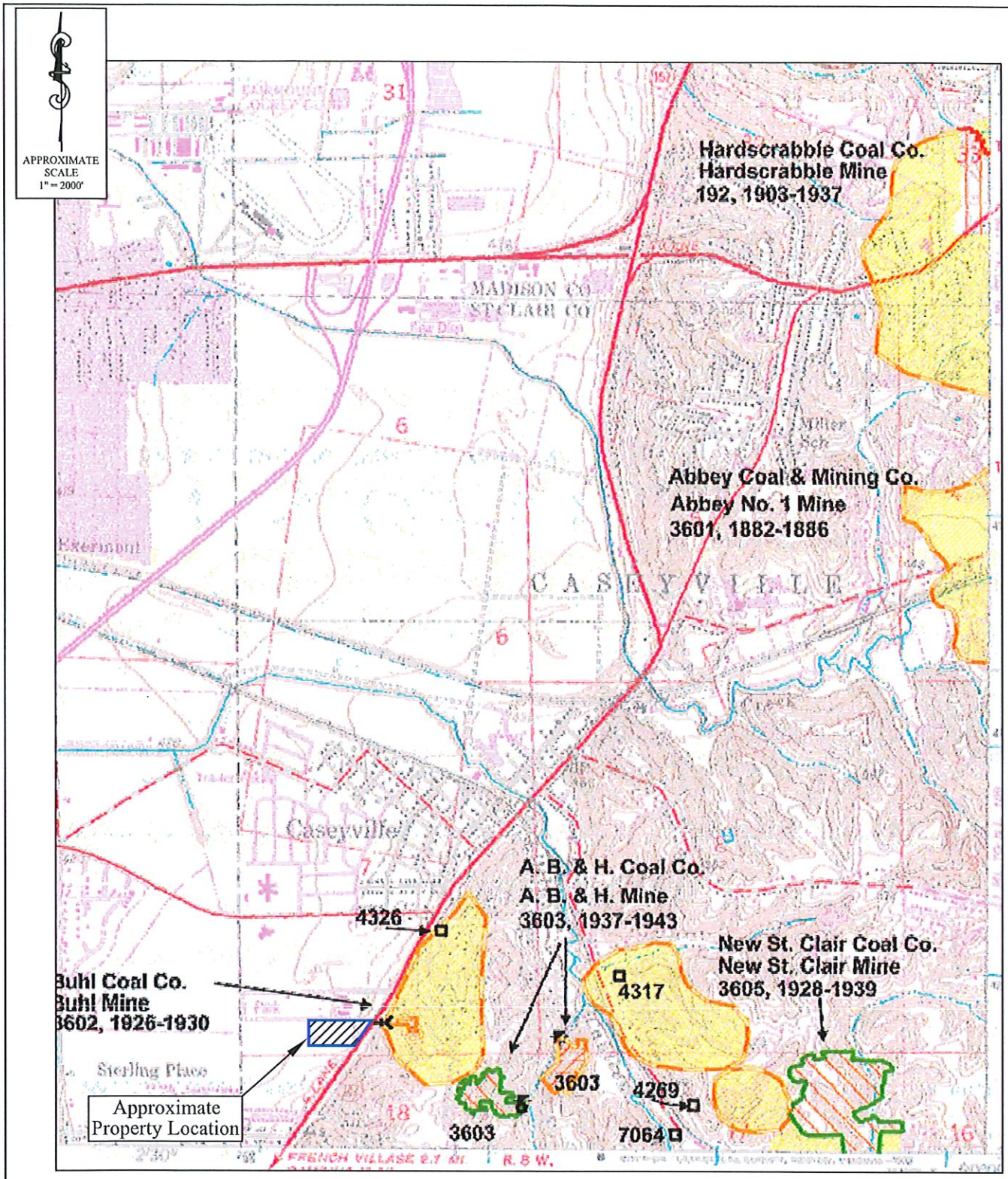

FIGURE 2

= SUBJECT PROPERTY

BASED ON OBSERVATIONS MADE BY THE STAFF OF QUALITY TESTING AND ENGINEERING, INC.
DIMENSIONS AND LOCATIONS ARE APPROXIMATE ACTUAL MAY VARY.
DRAWING NOT INTENDED FOR USE OTHER THAN AS PART OF THE REPORT FOR WHICH IT WAS CREATED.

QUALITY TESTING AND ENGINEERING, INC.
803 WEST STATE STREET, O'FALLON, IL. 62269
PHONE: 618-632-9900 FAX: 618-632-9922 EMAIL: QTE@QTEINC.COM

NEW CASEYVILLE POLICE STATION
Caseyville, Illlinois

MINE MAP

MARCH 2023 PROJECT NO. 23-0079-G

APPENDIX A

QUALITY TESTING AND ENGINEERING, INC.

BORING LOG LEGEND AND NOMENCLATURE

Items shown in Boring Logs refer to the following: Where shown in parentheses, sampling and testing were performed in general accordance with applicable ASTM standard methods or practices.

1. **Depth** - Depth below ground surface feet.

2. **Sample** - Types designated by letters.

   SS - Split-spoon sample, disturbed, obtained by driving 2-inch O.D. split-spoon sampler ASTM D 1586.

   ST - Thin-walled tube sample, undisturbed, obtained by penetration of a 3-inch diameter tube ASTM D 1587.

   AS - Auger samples, disturbed, taken from cuttings.

   NX - Rock core recovered by NX-sized coring bit.

   Recovery - Recovery is expressed as a ratio of the length recovered to the total length pushed, driven, or cored inches, e.g. - 9/12.

   Blows - Numbers indicate blows per 6 inches of sampler penetration when driven by a 140-pound hammer falling freely 30 inches ASTM D 1586. When number of blows reaches 50 without 6 inches of sampler penetration, the result is shown as a ratio of 50 to the actual penetration, e.g. 50/2 inches.

3. **Description** - Description according to the Unified Soil Classification: Description indicates soil constituents, and other classification characteristics ASTM D 2488. Delineations of strata represent approximate boundaries between soil types and the transition may be gradual. The delineations shown on the Boring Logs were used for analytical purposes only. The information should not be used as a basis for design and/or construction cost estimates without realizing that there can be variation from the conditions shown.

   GW - Water level observation.

4. **Laboratory test results**

   - Natural moisture content in percent ASTM D 2216.
   - Dry density of sample tested in pounds per cubic foot (pcf).
   - Unconfined compressive strength ASTM D 2166 in kips per square foot (ksf).
   - Liquid limit ASTM D 4318 in percent.
   - Plastic limit ASTM D 4318 in percent.

BORING LOG

PROJECT New Caseyville Police Station
LOCATION Caseyville, Illinois
DRILLER Midwest Drilling, Inc.
SURFACE ELEVATION _____ **DRILLING METHOD** 4" O.D. CFA

BORING NO. B-1
SHEET 1 **OF** 1
PROJECT NO. 23-0079-G
DATE DRILLED 3/10/23

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (IN/IN)	SAMPLE BLOWS (PER 6 IN)	DESCRIPTION	GRAPHIC	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LAB: MOISTURE CONTENT (%)	LAB: DRY DENSITY (PCF)	LAB: UNCONFINED COMPRESSIVE STRENGTH (KSF)	LAB: LIQUID LIMIT	LAB: PLASTIC LIMIT	DEPTH (FT)
0					Asphalt 3"									0
					Crushed Rock 3"		FILL							
					Gray, low plastic, SILTY CLAY									
	1	SS	15/18	12 7 11					19		1.0			
3														3
	2	ST	19/24					1	28 28	87.5 89.2	1.73			
					Gray, high plastic, CLAY		CH							
6	3	SS	18/18	3 3 5					33		4.0			6
9	4	SS	18/18	3 3 5					25		4.0			9
12					Brown and gray, low plastic, SILTY CLAY, trace sand		CL							12
	5	SS	18/18	3 3 4					26		1.5			
15														15
					Brown, fine, SAND		SP							
18	6	SS	10/18	1 3 4					24		--			18
					Boring terminated at 20 feet.									

WATER LEVEL:
- _____ NONE OBSERVED WHILE DRILLING
- 13 FT WHILE DRILLING
- _____ FT ____ HRS AFTER DRILLING
- _____ FT ____ HRS AFTER DRILLING

REMARKS:
1) Unconfined compressive strength test performed.

BORING LOG

PROJECT New Caseyville Police Station
LOCATION Caseyville, Illinois
DRILLER Midwest Drilling, Inc.
SURFACE ELEVATION _____ **DRILLING METHOD** 4" O.D. CFA

BORING NO. B-2
SHEET 1 **OF** 1
PROJECT NO. 23-0079-G
DATE DRILLED 3/10/23

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (IN/IN)	SAMPLE BLOWS (PER 6 IN)	DESCRIPTION	GRAPHIC	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LAB: MOISTURE CONTENT (%)	LAB: DRY DENSITY (PCF)	LAB: UNCONFINED COMPRESSIVE STRENGTH (KSF)	LAB: LIQUID LIMIT	LAB: PLASTIC LIMIT	DEPTH (FT)
0					Asphalt 3"									0
					FILL - Gray, low plastic, SILTY CLAY, with gravel		FILL							
	1	SS	8/18	36 20 19					21		--			
3					Dark brown, low plastic, SILTY CLAY		CL							3
	2	SS	8/18	2 3 5					31		3.0			
					Gray, high plastic, CLAY		CH							
6	3	SS	18/18	3 4 5					35		4.0			6
9	4	SS	18/18	3 4 5					23		4.0			9
12					Brown, low plastic, SILTY CLAY, some sand		CL							12
	5	SS	18/18	3 3 3					27		1.5			
15														15
18														18
	6	SS	18/18	2 3 3					34		1.0			
					Boring terminated at 20 feet.									

WATER LEVEL:

_____ NONE OBSERVED WHILE DRILLING
13 FT WHILE DRILLING
_____ FT ____ HRS AFTER DRILLING
_____ FT ____ HRS AFTER DRILLING

REMARKS:

BORING LOG

PROJECT New Caseyville Police Station
LOCATION Caseyville, Illinois
DRILLER Midwest Drilling, Inc.
SURFACE ELEVATION _____ **DRILLING METHOD** 4" O.D. CFA

BORING NO. B-3
SHEET 1 **OF** 1
PROJECT NO. 23-0079-G
DATE DRILLED 3/10/23

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (IN/IN)	SAMPLE BLOWS (PER 6 IN)	DESCRIPTION	GRAPHIC	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LAB: MOISTURE CONTENT (%)	LAB: DRY DENSITY (PCF)	LAB: UNCONFINED COMPRESSIVE STRENGTH (KSF)	LAB: LIQUID LIMIT	LAB: PLASTIC LIMIT	DEPTH (FT)
0					FILL - Brown, low plastic, SILT		FILL							0
	1	SS	4/18	11 11 13					23		1.0			
3	2	ST	4/24						21			39	27	3
					Brown and gray, low plastic, SILTY CLAY		CL							
6	3	SS	31/18	2 2 4					24		4.0			6
					Brown and gray, high plastic, CLAY		CH							
9	4	SS	16/18	2 3 4					26		4.0			9
12														12
	5	SS	18/18	4 5 8					24		4.0			
15														15
18														18
	6	SS	18/18	4 5 8					22		5.0			
					Boring terminated at 20 feet.									

WATER LEVEL:

_____ NONE OBSERVED WHILE DRILLING
18.5 FT WHILE DRILLING
_____ FT ____ HRS AFTER DRILLING
_____ FT ____ HRS AFTER DRILLING

REMARKS:

BORING LOG

PROJECT New Caseyville Police Station
LOCATION Caseyville, Illinois
DRILLER Midwest Drilling, Inc.
SURFACE ELEVATION _____ **DRILLING METHOD** 4" O.D. CFA

BORING NO. B-4
SHEET 1 **OF** 1
PROJECT NO. 23-0079-G
DATE DRILLED 3/10/23

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (IN/IN)	SAMPLE BLOWS (PER 6 IN)	DESCRIPTION	GRAPHIC	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LAB: MOISTURE CONTENT (%)	LAB: DRY DENSITY (PCF)	LAB: UNCONFINED COMPRESSIVE STRENGTH (KSF)	LAB: LIQUID LIMIT	LAB: PLASTIC LIMIT	DEPTH (FT)
0					FILL - Brown, low plastic, SILTY CLAY		CL							0
	1	SS	10/18	5 3 3					18		3.0			
3					Brown and gray, high plastic, CLAY		CH							3
	2	SS	18/18	2 2 4					24		1.0			
					Boring terminated at 5 feet.									
6														6
9														9
12														12
15														15
18														18

WATER LEVEL:

_____ NONE OBSERVED WHILE DRILLING
_____ FT WHILE DRILLING
_____ FT ____ HRS AFTER DRILLING
_____ FT ____ HRS AFTER DRILLING

REMARKS:

BORING LOG

PROJECT New Caseyville Police Station
LOCATION Caseyville, Illinois
DRILLER Midwest Drilling, Inc.
SURFACE ELEVATION _____ **DRILLING METHOD** 4" O.D. CFA

BORING NO. B-5
SHEET 1 **OF** 1
PROJECT NO. 23-0079-G
DATE DRILLED 3/10/23

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (IN/IN)	SAMPLE BLOWS (PER 6 IN)	DESCRIPTION	GRAPHIC	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LAB: MOISTURE CONTENT (%)	LAB: DRY DENSITY (PCF)	LAB: UNCONFINED COMPRESSIVE STRENGTH (KSF)	LAB: LIQUID LIMIT	LAB: PLASTIC LIMIT	DEPTH (FT)
0					Brown, low plastic, SILTY CLAY		CL							0
	1	SS	13/18	1 2 3					27		2.0			
3					Brown and gray, high plastic, CLAY		CH							3
	2	SS	18/18	2 3 5					27		5.0			
					Boring terminated at 5 feet.									
6														6
9														9
12														12
15														15
18														18

WATER LEVEL:

_____ NONE OBSERVED WHILE DRILLING
_____ FT WHILE DRILLING
_____ FT ____ HRS AFTER DRILLING
_____ FT ____ HRS AFTER DRILLING

REMARKS:

BORING LOG

PROJECT New Caseyville Police Station
LOCATION Caseyville, Illinois
DRILLER Midwest Drilling, Inc.
SURFACE ELEVATION _____ **DRILLING METHOD** 4" O.D. CFA

BORING NO. B-6
SHEET 1 **OF** 1
PROJECT NO. 23-0079-G
DATE DRILLED 3/10/23

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (IN/IN)	SAMPLE BLOWS (PER 6 IN)	DESCRIPTION	GRAPHIC	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LAB: MOISTURE CONTENT (%)	LAB: DRY DENSITY (PCF)	LAB: UNCONFINED COMPRESSIVE STRENGTH (KSF)	LAB: LIQUID LIMIT	LAB: PLASTIC LIMIT	DEPTH (FT)
0					FILL - Brown, low plastic, SILTY CLAY		FILL							0
	1	SS	13/18	4, 5, 7					19		3.0			
3					Dark brown, low plastic, SILTY CLAY		CL							3
	2	SS	17/18	2, 2, 4					30		2.0			
					Boring terminated at 5 feet.									
6														6
9														9
12														12
15														15
18														18

WATER LEVEL:

_____ NONE OBSERVED WHILE DRILLING
_____ FT WHILE DRILLING
_____ FT ____ HRS AFTER DRILLING
_____ FT ____ HRS AFTER DRILLING

REMARKS:

SECTION 00 31 43 - PERMIT APPLICATION

PART 1 - Permit Application

1.1 PERMIT APPLICATION INFORMATION

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. This Document and its attachments are not part of the Contract Documents.

B. Each Bid Package Contractor to Complete as needed.
   1. Permit Application: Complete building permit application and file with authorities having jurisdiction (Village of Caseyville) within five days of the Notice of Award. No fee will be charged by the city for this building permit.

END OF SECTION 00 31 43

***This document to be utilized for all clarification requests prior to bid – Emailed to contact@aaicinc.com**
***Question deadline is October 11, 2023, 10:00 a.m., local time**
***Must be submitted by Bidding Contractor, subcontractor/supplier will not be reviewed.**

AAIC inc.
One Design Mesa
Collinsville, Illinois
62234
p 618.345.1270
f 618.345.1282
www.aaicinc.com
architects interiors planners

RFC #: (by a/e)		**Date:**	
Project Name:	Police Station Addition to the Caseyville Village Hall	**AAIC #:**	20018

Request For Clarification (pre-bid)

From: Phone:

Company:

Address: Fax:

Please Check One of the Following Clarification Categories:

☐ Interpretation of Contract Documents ☐ Information not shown on Contract Documents
☐ Conflict in Contract Documents ☐ Coordination Problems ☐ Substitution

Please List the Appropriate Bid Document Reference for this Request for Clarification:

Specification Section, Page, and Item # Reference: _____

Drawing / Detail Number Reference: _____

Question:

Reply:

Attachments:

Signature: _____

Date: _____

Received by A/E: Date: _____ Time: _____

Forward response to Contractor(s): Date: _____ Time: _____

SECTION 00 41 13 - BID FORM

1.1 BID INFORMATION

To: Village of Caseyville
909 S. Main Street
Caseyville, IL 62232

From: Operating as (strike out conditions that do not apply (an Individual,) (a Corporation, organized and existing under the law of the State of _____,) (a Partnership,) (a Joint Venture consisting of the firm of:) _____

_____

_____

_____

1..2 BASE BID PROPOSAL:

A. Drawings and Specifications 9/18/2023, for the Police Station Addition to the Caseyville Village Hall, located at 909 S. Main Street, Caseyville, Illinois and having examined the site where the work is to be executed; and having become familiar with local conditions as they might in any way affect the cost and/or execution of the work; and having carefully examined the aforesaid drawings, specifications and other related documents and addenda thereto, the undersigned Bidder hereby proposes and agrees to provide all labor, materials, plant, equipment, transportation, and other facilities as necessary and/or required for the complete and satisfactory execution of the work for which this proposal is submitted, for the lump-sum consideration as stated hereinafter:

B. Bidders must show bid amount in both words and figures. In case of discrepancy, amount shown in words shall govern.

C. DO NOT SUBMIT BID CLARIFICATIONS, QUALIFICATIONS OR ALTER THE BID FORM.

D. AGREES:
1. To hold this bid open until 60 calendar days after bid opening date or as otherwise noted.
2. To accept the provisions of the Instruction to Bidders regarding disposition of bid security.
3. To enter into and execute a contract with the Owner, if awarded, on the basis of this bid and in connection therewith to:
   a. Furnish all bonds and insurance required by the bidding documents.
   b. Accomplish the work in accordance with the Contract.
   c. Complete the work within the contract time herein specified.

E. In submitting this bid it is understood that the right is reserved by the Owner to reject any or all bids.

F. Contract time In accordance with Section 01 10 00 – Summary/Bid Packages Schedule.

G. Complete or leave blank sections below corresponding to packages named contractor above is bidding.

BID PACKAGE NO. 1 – SITE

BASE BID

Bidder agrees to provide all labor and materials and to perform all work shown or specified for Base Bid in the bidding documents for the sum of:

_____DOLLAR'S $(_____)

BID PACKAGE NO. 2 – BUILDING SHELL

BASE BID

Bidder agrees to provide all labor and materials and to perform all work shown or specified for Base Bid in the bidding documents, exclusive of alternate bids, for the sum of:

_____DOLLAR'S $(_____)

BID PACKAGE NO. 3 – INTERIOR

BASE BID

Bidder agrees to provide all labor and materials and to perform all work shown or specified for Base Bid in the bidding documents, exclusive of alternate bids, for the sum of:

_____DOLLAR'S $(_____)

BID PACKAGE NO. 4 – FIRE SUPPRESSION

BASE BID

Bidder agrees to provide all labor and materials and to perform all work shown or specified for Base Bid in the bidding documents, exclusive of alternate bids, for the sum of:

_____DOLLAR'S $(_____)

BID PACKAGE NO. 5 – PLUMBING

BASE BID

Bidder agrees to provide all labor and materials and to perform all work shown or specified for Base Bid in the bidding documents, exclusive of alternate bids, for the sum of:

_____DOLLAR'S $(_____)

BID PACKAGE NO. 6 – MECHANICAL

BASE BID

Bidder agrees to provide all labor and materials and to perform all work shown or specified for Base Bid in the bidding documents, exclusive of alternate bids, for the sum of:

_____DOLLAR'S $(_____)

BID PACKAGE NO. 7 – ELECTRICAL

BASE BID

Bidder agrees to provide all labor and materials and to perform all work shown or specified for Base Bid in the bidding documents, exclusive of alternate bids, for the sum of:

_____DOLLAR'S $(_____)

1.3 BEP PARTICIPATION

Bidding Contractor MBE/FBE Certified **(circle one)** MBE/FBE – **YES or NO**

Bidding Contractor has included the below amounts of qualified BEP Participation within their base bid:

Contractor Name/Supplier: Work/Product Scope: $Value of Scope: MBE/FBE(List Cert)

1.4 ACKNOWLEDGEMENT OF ADDENDA

H. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:

1. Addendum No. 1, dated _____.
2. Addendum No. 2, dated _____.
3. Addendum No. 3, dated _____.
4. Addendum No. 4, dated _____.
5. Addendum No. 5, dated _____.

1.5 BID SECURITY:

A. Bid Security is attached, without endorsement. Bid Security required for all Bidding Packages.

1.6 PROPOSED PRODUCT SUBSTITUTION

A. The Base Bid includes only products specified in the bidding documents.

B. Bidder's proposal shall be in accord with the provisions of Division 01, Section "Substitution Procedures".

GENERAL STATEMENT:

A. The undersigned has checked all of the figures contained in this proposal and further understands that the Owner will not be responsible for any errors or omissions made therein by the undersigned.

B. The undersigned agrees to assist and cooperate with the Owner in preparing the formal Contract and shall execute same and return it to the Owner along with surety bonds and insurance certificates, as may be required by the specifications and other Contract Documents, within 10 days following its receipt.

C. The undersigned further agrees to begin work on said contract as soon as practical, after date of "Contract" or "Notice to Proceed," whichever is earlier; or, in any case the undersigned fails or neglects to appear within the specified time to execute the Contract, the undesigned will be considered as having abandoned it, and the Bid Security accompanying this proposal will be forfeited to Owner as liquidated damages for delay and loss caused to Owner by reason of such failure on the part of the under signed.

D. It is understood that the right is reserved by Owner to reject any or all proposals, to waive all informalities and irregularities in connection therewith, and to award a contract for any part of the work or the project as a whole. The undersigned declares that the person(s) signing this proposal is/are fully authorized to sign on behalf of the named firm and to fully bind the named firm to all the conditions and provisions thereof.

E. It is agreed that no person(s) or company other than the firm listed below or as otherwise indicated hereinafter has any interest whatsoever in this proposal or the Contract that may be entered into as a result thereof, and that in all respects the proposal is legal and fair, submitted in good faith, without collusion or fraud.

F. It is agreed that the undersigned has complied or will comply with all requirements concerning licensing and with all other local, state, and national laws, and that no legal requirements have been or will be violated in making or accepting this proposal, in awarding the Contract to him, or in the prosecution of the work required thereunder.

G. EVALUATION: Contract award will be made in accord with Instruction to Bidders.

H. REPRESENTATION & CERTIFICATIONS: The Bidder by the execution of this Bid Form makes the following representations and certifications as a part of this bid on the project identified in the Bid Form. In the case of a joint venture bid, each party represents and certifies as to his own organization.

I. SURETY: I have notified a surety company that I am submitting a bid for work to be performed on the project. The surety company has agreed to issue a Performance Bond and Labor and Material Payment Bond for my work on an appropriate form if my bid is accepted and the Owner awards me the Contract.

J. AVAILABILITY: The number and amount of other contracts and awards pending which I am or will become obligated to perform, now and during the course of my work on this project, will not interfere with or hinder the timely prosecution of my work.

K. INDEPENDENT PRICE DETERMINATION: The contact sum in this bid has been arrived at independently, without consultation, communication or agreement for the purpose of restricting competition.

L. OPEN COMPETITION: I have not offered any money or other valuable things to any person to induce him not to bid on this project or as recompense for his not having bid

on this project, and therefore have not violated prevention of competition provisions in preparing my bid.

M. PREVAILING WAGE: I will pay and require each subcontractor(s) to pay not less than the general prevailing wage rate of hourly wages for work of similar character in the locality in which the work is performed and not less than general prevailing rate of hourly wages for legal holidays and overtime work, as determined by the Illinois Department of Labor.

N. PROJECT LABOR AGREEMENT: Will engage, execute, and abide by required PLA for project.

O. IL PROVISIONS: Bidder certifies it will abide by all State of Illinois Provisions required by this contract.

P. ALLOWANCES: Bidder certifies that all allowances are included in base bid amount above.

Q. TAX EXEMPT: This project is Tax Exempt. A certificate will be issued to successful bidders upon Notice of Award.

I hereby certify that all statements herein are made:

_____

Name of Individual

On behalf of:

_____

Name of Corporation, Partnership or Individual submitting bid

END OF SECTION 00 41 13

SECTION 00 43 13 - BID SECURITY FORMS

PART 1 - Bid Security Forms

1.1 BID FORM SUPPLEMENT

A. A completed bid bond form is required to be attached to the Bid Form.

1.2 BID BOND FORM

A. AIA Document A310, "Bid Bond," is the recommended form for a bid bond. A bid bond acceptable to Owner, or other bid security as described in the Instructions to Bidders, is required to be attached to the Bid Form as a supplement.

B. Copies of AIA standard forms may be obtained from The American Institute of Architects; www.aia.org/contractdocs/purchase/index.htm; email: docspurchases@aia.org; (800) 942-7732.

END OF SECTION 00 43 13

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

TBD

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)
Village of Caseyville
909 S. Main Street
Caseyville, IL 62232

BOND AMOUNT: $

PROJECT:
(Name, location or address, and Project number, if any)
Police Station Addition to the Caseyville Village Hall
909 S. Main Street
Caseyville, IL 62232

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.
If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

Signed and sealed this day of ,

	(Contractor as Principal) *(Seal)*
(Witness)	*(Title)*
	(Surety) *(Seal)*
(Witness)	*(Title)*

SECTION 00 43 93 - BID SUBMITTAL CHECKLIST

PART 1 - Bid Submittal Checklist

1.1 BID INFORMATION

A. Bidder: _____.

B. Bid Package(s):_____.

C. Project Name: Police Station Addition to the Caseyville Village Hall

D. Project Location: 909 S. Main Street, Caseyville, IL 62232

E. Owner: Village of Caseyville

F. Architect: AAIC Inc.

G. Architect Project Number: 20018

H. Construction Manager: AAIC Inc.

1.2 BIDDER'S CHECKLIST

A. In an effort to assist the Bidder in properly completing all documentation required, the following checklist is provided for the Bidder's convenience. The Bidder is solely responsible for verifying compliance with bid submittal requirements.

B. This completed checklist can be attached to the outside of the Submittal envelope.
   1. Bid Envelope
      a. shows the name and address of the Bidder.
      b. shows name of Project being bid.

   2. Bid Form provided in the Project Manual.
      a. Prepared the Bid Form as required by the Instructions to Bidders.
      b. Indicated on the Bid Form the Addenda received.
      c. Indicated on the Bid Form the BEP information.

   3. Attached to the Bid Form: Bid Bond OR a certified check for the amount required.

   4. PLA Letter of Assent from Bidding Contractor.

END OF SECTION 00 43 93

STATE OF ILLINOIS PROVISIONS

ILL 1. Access to Third Party Contracts

The Contractor(s) shall permit the authorized representatives of the Village of Caseyville (Owner) and or the State of Illinois to inspect and audit all data and records of the Contractor(s) relating to the Contractor(s) performance under any subsequent contract or agreement. This applies to all third party contract records (at any tier), as required. The Contractor(s) and its subcontractor(s) shall maintain books, records, and documents and shall undertake such accounting procedures and practices as may be deemed necessary to assure proper accounting of all funds paid pursuant to any subsequent contract or agreement. All costs charged to items performed under any subsequent contract or agreement shall be supported by properly executed and clearly identified invoices, contracts, vouchers, or checks evidencing in detail the nature and propriety of the charges. These records shall be subject at all reasonable times of the normal business day to inspection, review, or audit by the Owner, its authorized representative(s), the US Secretary of Transportation, Comptroller, the State Auditor, or other governmental officials authorized by law to monitor the contract or agreement and project site. The Contractor(s) fiscal management system shall include the capability to provide accurate, current, and complete disclosure of the financial status of any subsequent contract or agreement upon request.

ILL 2. Lobbying

Contractor(s) that apply or bid for an award exceeding $100,000 must file the required Byrd Anti-Lobbying Amendment certification. Each tier certifies to the tier above that it will not and has not used federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any federal contract, grant or any other contract award covered by 31 U.S.C. § 1352. Each tier must also disclose any lobbying with non-federal funds that takes place in connection with obtaining any Federal award. Pursuant to Federal regulations, the Contractor(s) are required to have all subcontractor(s) providing more than $100,000.00 in services or materials to also complete this certification and include it with any Bid/Proposal submittal. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, “Disclosure Form to Report Lobbying,” in accordance with its instructions.

ILL 3. Prevailing Wage Act

ILL 4. Certified Payrolls

Contractor to provide.

ILL 5. Compliance with Federal Funding Accountability and Transparency Act of 2006

Contractor certifies that it does and will comply with the reporting requirements of the Federal Funding Accountability and Transparency Act of 2006 (P.L. 109-282) (FFATA) with respect to Federal Awards greater than or equal to $30,000. A FFATA sub-award report must be filed by the end of the month following the month in which the award was made.

ILL 6. Prohibited Interest of Local Official

No member, or officer, or employee of the Owner or local public body with financial interest or control in this contract during their tenure or for one year thereafter shall have any interest, direct or indirect, in this contract or the proceeds thereof.

ILL 7. Contract Changes

Any proposed change in this contract shall be submitted to the Owner for its prior approval.

ILL 8. Subcontracts

The Contractor(s) shall not enter into any sub-contracts or agreements or start any work by the work forces of a subcontractor(s), or use any materials from the stores of a subcontractor(s), with respect to this acquisition Project and any subsequent contracts, without the prior concurrence of the Owner. All such subcontracts and agreements shall be approved by the Owner.

ILL 9. IDHR Registration

Vendor must provide proof of registration with the Illinois Department of Human Rights.

ILL 10. Assignment

The Contractor(s) shall not assign its performance of any portion of the specified services under any subsequent contract or agreement without the advance written consent of the Owner. It is hereby understood and agreed; that said consent must be sought in writing not less than ten (10) calendar days prior to the date of any proposed assignment. The Owner reserve the right to accept or reject any such assignment, although the Owner acceptance shall not be unreasonably withheld. Acceptance of subcontractor(s)'s is contingent upon each subcontractor(s)'s ability to comply with the applicable terms, conditions, and clauses, particularly the assurances, contained in any subsequent contract or agreement.

ILL 11. Retention of Records

The Contractor(s) shall comply with 49 U.S.C. § 5325(g), and federal access to records requirements as set forth in the applicable U.S. DOT Common Rules. Contractor(s) is to maintain verifiable records which include all Project eligible costs incurred while completing those tasks contained in any contracted Scope of Work. The Contractor(s) shall retain all books, records, documents, and other material relevant to any subsequent contract or agreement for a period of five (5) calendar years following the Owner’s final payment and all other pending matters are closed. If any litigation, claim, negotiation, audit, or other action involving any contract or agreement for a Project's records has been initiated prior to the expiration of the five-year period, the Contractor(s) shall retain the appropriate records of the Project for the five-year period immediately following completion of the action and resolution of all issues arising from it. The Contractor(s) agrees that the Owner or its designee shall have full access and the right to examine any of said records at all reasonable times during said period.

ILL 12. Government (IL) Inspection

The Contractor(s) shall permit the any authorized representatives of the Owner to inspect and audit all data and records of the Contractor(s) relating to the Contractor(s) performance under any subsequent contract or agreement. This applies to all third party contract records (at any tier), as required. The Contractor(s) and its subcontractor(s) shall maintain books, records, and documents and shall undertake such accounting procedures and practices as may be deemed necessary to assure proper accounting of all funds paid pursuant to any subsequent contract or agreement. All costs charged to items performed under any subsequent contract or agreement shall be supported by properly executed and clearly identified invoices, contracts, vouchers, or checks evidencing in detail the nature and propriety of the charges. These records shall be subject at all reasonable times of the normal business day to inspection, review, or audit by the Owner, its authorized representative(s), the US Secretary of Transportation, Comptroller, the State Auditor, or other governmental officials authorized by law to monitor the contract or agreement and project site. The Contractor(s) fiscal management system shall include the capability to provide accurate, current, and complete disclosure of the financial status of any subsequent contract or agreement upon request.

ILL 13. Prime Contractor(s) Participation

Contractor(s) shall perform, with his own staff, work equivalent to at least fifty percent (50%) of the total amount of work for the Project. Only non-equipment and materials pay items of a contact will be used in computing the total amount of work conducted by the prime contractor(s) at the work site.

ILL 14. Warranty of Construction

Construction shall be warrantied for a minimum period of one (1) calendar year from the date of substantial completion. At a minimum, the Contractor(s) warrants that work performed under any contract conforms to the contract requirements and is free of any defect of equipment, material, or workmanship performed by the Contractor(s) or any of its subcontractor(s)s or suppliers. The Owner shall be entitled to all warranties as provided by law.

ILL 15. Labor Hours Performed by IL Residents

Fifty percent of the labor hours on the project must be performed by actual residents of the State of Illinois in accordance with Article 80 of the FY10 Budget Implementation (Capital) Act, P.A. 96-37 (HB 2424.)

ILL 16. Clean Air Act and Federal Water Pollution Control Act (contracts >$150,000)

The Contractor(s) agrees: (1) It will not use any violating facilities; (2) It will report the use of facilities placed on or likely to be placed on the U.S. EPA “List of Violating Facilities;” (3) It will report violations of use of prohibited facilities to FTA; (4) It will comply with the inspection and other requirements of the Clean Air Act, as amended, (42 U.S.C. §§ 7401 – 7671q); and the Federal Water Pollution Control Act as amended, (33 U.S.C. §§ 1251-1387); and (5) The Contractor(s) also agrees to include this requirement in each subcontract at every tier.

ILL 17. Debarment, Suspension, Ineligibility and Voluntary Exclusion (contracts ≥$25,000)

The Contractor(s) shall comply and facilitate compliance with U.S. DOT regulations, “Nonprocurement Suspension and Debarment,” 2 C.F.R. part 1200, which adopts and supplements the U.S. Office of Management and Budget (U.S. OMB) “Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement),” 2 C.F.R. part 180.

ILL 18. Recycled Products

The Contractor(s) agrees to provide a preference for those products and services that conserve natural resources, protect the environment, and are energy efficient by complying with and facilitating compliance with Section 6002 of the Resource Conservation and Recovery Act, as amended, 42 U.S.C. § 6962, and U.S. Environmental Protection Agency (U.S. EPA), “Comprehensive Procurement Guideline for Products Containing Recovered Materials,” 40 C.F.R. part 247. (2) This requirement flows down to all contractor(s) and subcontractor(s) tiers where the value of an EPA designated item exceeds $10,000.

ILL 19. Drug Free Workplace Act [30 ILCS 580]

The Owner desires a drug and alcohol-free jobsite. Contractor and subcontractors shall maintain a drug and alcohol-free workplace environment to ensure worker safety and workplace integrity. The Contractor and each subcontractor shall pay all costs associated with the testing of their own personnel.

ILL 20. Indemnify IDNR

The sponsoring agency shall indemnify, protect, defend and hold harmless the Department from any and all liability, costs, damages, expenses, or claims arising under, through or by virtue of the construction, operation and maintenance of PARC assisted facilities.

ILL 21. Steel Products Procurement Act [30 ILCS 565]
Steel products used or supplied by the Contractor(s) or a subcontract thereto, shall be manufactured or produced in the United States in accordance with this Act.

ILL 22. Illinois Works Apprenticeship Initiative
Apprentices will perform either 10% of the total labor hours actually worked in each prevailing wage classification or 10% of the estimated labor hours in each prevailing wage classification, whichever is less. Each Bid Package Contractor will be required to submit the Periodic Reporting Form found in section 00 81 01. Fillable forms can be provided upon request.

[End of document]

SECTION 00 60 00 - FORMS

PART 1 - Forms

1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

A. The following form of Owner/Contractor(s) Agreement and form of the General Conditions shall be used for Project:

1. AIA Document A132, "Standard Form of Agreement between Owner and Contractor(s)."

    a. The General Conditions for Project are AIA Document A232, "General Conditions of the Contract for Construction."

2. The General Conditions are included in the Project Manual.
3. The Supplementary Conditions for Project are separately prepared and included in the Project Manual.
4. Owner's document(s) bound following this Document.

1.2 ADMINISTRATIVE FORMS

A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.

B. Copies of AIA standard forms may be obtained from the American Institute of Architects; http://www.aia.org/contractdocs/purchase/index.htm; docspurchases@aia.org; (800) 942-7732.

C. Preconstruction Forms:

1. Form of Performance Bond and Labor and Material Bond: AIA Document A312, "Performance Bond and Payment Bond."
2. Form of Certificate of Insurance: AIA Document G715, "Supplemental Attachment for ACORD Certificate of Insurance 25-S."

D. Information and Modification Forms:

1. Form for Requests for Information (RFIs): AIA Document G716, "Request for Information (RFI)."
2. Form of Request for Proposal: AIA Document G709, "Work Changes Proposal Request."
3. Change Order Form: AIA Document G701, "Change Order."
4. Form of Architect's Memorandum for Minor Changes in the Work: AIA Document G707, "Architect's Supplemental Instructions."
5. Form of Change Directive: AIA Document G714, "Construction Change Directive."

E. Payment Forms:

1. Schedule of Values Form: AIA Document G703, "Continuation Sheet."
2. Payment Application: AIA Document G702/703, "Application and Certificate for Payment and Continuation Sheet."
3. Form of Contractor(s) Affidavit: AIA Document G706, "Contractor(s) Affidavit of Payment of Debts and Claims."
4. Form of Affidavit of Release of Liens: AIA Document G706A, "Contractor(s) Affidavit of Payment of Release of Liens."
5. Form of Consent of Surety: AIA Document G707, "Consent of Surety to Final Payment."

END OF SECTION 00 60 00

DOCUMENT 00 73 00 - INSURANCE REQUIREMENTS

The Certificate of Insurance must:

- Be an original document.
- Contain an Additional Insured Endorsement including Ongoing Operations (Blanket or Automatic forms are acceptable) and completed operations coverage, form - Additional Insured CG2037 or equivalent and attached to the Certificate of Insurance.
- Waiver of Subrogation on the Workers' Compensation and General Liability policies in favor of Village of Caseyville, AAIC Inc.
- Provide at least 30 days notice of cancellation.
- Show complete insurance carrier names as listed in the A.M. Best Property & Casualty Guide
- State coverage is for "Operations performed by the Insured" for Village of Caseyville, and AAIC Inc.

The Certificate of Insurance must be completed in its entirety and signed.
Binders are not acceptable

Commercial General Liability(CGL) (occurrence form) coverage not less than:

$2,000,000	General Aggregate
$2,000,000	Products and Completed Operations Aggregate
$1,000,000	Each Occurrence
$1,000,000	Damage to Rented Premises
$1,000,000	Personal & Adv. Injury

Commercial Automobile Liability:

$1,000,000	Combined Single Limit

Workers Compensation:

$3,000,000	Each Accident
$3,000,000	Disease – Each Employee
$3,000,000	Disease – Policy limit

Employers' Liability Coverage:

$1,000,000	Each Accident
$1,000,000	Disease – Policy Limit
$1,000,000	Disease – Each Employee

Umbrella / Excess Liability Coverage:

$2,000,000	Each Occurrence
$2,000,000	Aggregate

Above limits can be provided by any combination of primary and excess/umbrella policies.

Coverage must be placed with a carrier rated not less than A-VIII in the most currently published A.M. Best's Rating Guide.

Owner, Construction Manager, Architect, and their Consultants shall be named as additional insured by Contractor(s) and Sub-Contractor(s).

Performance and Payment Bonds will be required by all Bid Package Contractors.

Bid Package Contractors to provide Builder Risk Insurance / Property Insurance in amount of full contract value.

END OF SECTION 00 73 00

AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

TBD

OWNER:
(Name, legal status and address)
Village of Caseyville
909 S. Main Street
Caseyville, IL 62232

CONSTRUCTION CONTRACT
Date:
Amount: $ 0.00
Description:
(Name and location)
Police Station Addition to the
Caseyville Village Hall
909 S. Main Street
Caseyville, IL 62232

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL
Company: *(Corporate Seal)*

Signature: _____
Name and
Title:

SURETY
(Name, legal status and principal place of business)

Company: *(Corporate Seal)*

Signature: _____
Name and
Title:

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)
AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)
AAIC inc.
One Design Mesa
Collinsville, IL 62234
618-345-1270

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address:		Address:	

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Calvin C. Morris, AIA, NCARB; Principal-In-Charge, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 15:23:39 ET on 02/04/2022 under Order No. 6936309273 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A312™ – 2010, Performance Bond, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

AIA® Document A312® – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

TBD

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)
Village of Caseyville
909 S. Main Street
Caseyville, IL 62232

CONSTRUCTION CONTRACT
Date:
Amount: $ 0.00
Description:
(Name and location)
Police Station Addition to the Caseyville Village Hall
909 S. Main Street
Caseyville, IL 62232

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)
AAIC inc.
One Design Mesa
Collinsville, IL 62234
618-345-1270

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

.2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	
Address:		Address:	

AIA® Document A132® – 2019

Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition

AGREEMENT made as of the day of in the year
(In words, indicate day, month, and year.)

BETWEEN the Owner:
(Name, legal status, address, and other information)

Village of Caseyville
909 S. Main Street
Caseyville, IL 62232

and the Contractor:
(Name, legal status, address, and other information)

TBD

for the following Project:
(Name, location, and detailed description)

Police Station Addition to the Caseyville Village Hall
909 S. Main Street
Caseyville, IL 62232

The Construction Manager:
(Name, legal status, address, and other information)

AAIC inc.
One Design Mesa
Collinsville, IL 62234

The Architect:
(Name, legal status, address, and other information)

AAIC inc.
One Design Mesa
Collinsville, IL 6223

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser. AIA Document A232™–2019 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than Modifications, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[ ] A date set forth in a notice to proceed issued by the Owner.

[ ] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion of the Project or Portions Thereof

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the date of Substantial Completion of the Work of all of the Contractors for the Project will be:
(Insert the date of Substantial Completion of the Work of all Contractors for the Project.)

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of all of the Contractors for the Project are to be completed prior to Substantial Completion of the entire Work of all of the Contractors for the Project, the Contractors shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.4 When the Work of this Contract, or any Portion Thereof, is Substantially Complete
§ 3.4.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall substantially complete the entire Work of this Contract:
(Check one of the following boxes and complete the necessary information.)

[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[ ] By the following date:

§ 3.4.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of this Contract are to be substantially complete prior to when the entire Work of this Contract shall be substantially complete, the Contractor shall substantially complete such portions by the following dates:

Portion of Work	Date to be substantially complete

§ 3.4.3 If the Contractor fails to substantially complete the Work of this Contract, or portions thereof, as provided in this Section 3.4, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM
§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:
(Check the appropriate box.)

[ ] Stipulated Sum, in accordance with Section 4.2 below

[ ] Cost of the Work plus the Contractor's Fee, in accordance with Section 4.3 below

[ ] Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 4.4 below

(Based on the selection above, complete Section 4.2, 4.3 or 4.4 below.)

§ 4.2 Stipulated Sum
§ 4.2.1 The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2.2 Alternates
§ 4.2.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.2.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.2.4 Unit prices, if any:
(Identify the item and state the unit price, and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3 Cost of the Work Plus Contractor's Fee without a Guaranteed Maximum Price
§ 4.3.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.3.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

§ 4.3.3 The method of adjustment of the Contractor's Fee for changes in the Work:

§ 4.3.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

§ 4.3.5 Rental rates for Contractor-owned equipment shall not exceed percent (%) of the standard rental rate paid at the place of the Project.

§ 4.3.6 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3.7 The Contractor shall prepare and submit to the Construction Manager, within 14 days of executing this Agreement, a written Control Estimate for the Owner's review and approval. The Control Estimate shall include the items in Section B.1 of Exhibit B, Determination of the Cost of the Work.

§ 4.4 Cost of the Work Plus Contractor's Fee with a Guaranteed Maximum Price
§ 4.4.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.4.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

§ 4.4.3 The method of adjustment of the Contractor's Fee for changes in the Work:

§ 4.4.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

§ 4.4.5 Rental rates for Contractor-owned equipment shall not exceed percent (%) of the standard rental rate paid at the place of the Project.

§ 4.4.6 Unit Prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.4.7 Guaranteed Maximum Price
§ 4.4.7.1 The Contract Sum is guaranteed by the Contractor not to exceed ($), subject to additions and deductions by Change Order as provided in the Contract Documents. This maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.

§ 4.4.7.2 Alternates
§ 4.4.7.2.1 Alternates, if any, included in the Guaranteed Maximum Price:

Item	Price

§ 4.4.7.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.4.7.3 Allowances, if any, included in the Guaranteed Maximum Price:
(Identify each allowance.)

Item	Price

§ 4.4.7.4 Assumptions, if any, upon which the Guaranteed Maximum Price is based:
(Identify each assumption.)

§ 4.4.8 To the extent that the Contract Documents are anticipated to require further development, the Guaranteed Maximum Price includes the costs attributable to such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include changes in scope, systems, kinds and quality of materials, finishes, or equipment, all of which, if required, shall be incorporated by Change Order.

§ 4.4.9 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in Section 4.4.7.4. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions contained in Section 4.4.7.4 and the revised Contract Documents.

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any, to be assessed in accordance with Section 3.4.)

§ 4.6 Other:
(Insert provisions for bonus, cost savings or other incentives, if any, that might result in a change to the Contract Sum.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Construction Manager by the Contractor, and Certificates for Payment issued by the Construction Manager and Architect, the Owner shall make progress payments on account of the Contract Sum, to the Contractor, as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Construction Manager not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment of the amount certified shall be made by the Owner not later than ( ) days after the Construction Manager receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Progress Payments Where the Contract Sum is Based on a Stipulated Sum

§ 5.1.4.1 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.4.2 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.4.3 In accordance with AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.4.3.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.4.3.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5 Progress Payments Where the Contract Sum is Based on the Cost of the Work without a Guaranteed Maximum Price

§ 5.1.5.1 With each Application for Payment, the Contractor shall submit the cost control information required in Exhibit B, Determination of the Cost of the Work, along with payrolls, petty cash accounts, receipted invoices, or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor, plus payrolls for the period covered by the present Application for Payment, less that portion of the payments attributable to the Contractor's Fee.

§ 5.1.5.2 Applications for Payment shall show the Cost of the Work actually incurred by the Contractor through the end of the period covered by the Application for Payment and for which the Contractor has made or intends to make actual payment prior to the next Application for Payment.

§ 5.1.5.3 In accordance with AIA Document A232-2019 and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.5.3.1 The amount of each progress payment shall first include:

- **.1** The Cost of the Work as described in Exhibit B, Determination of the Cost of the Work;
- **.2** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and
- **.3** The Contractor's Fee computed upon the Cost of the Work described in the preceding Section 5.1.5.3.1.1 at the rate stated in Section 4.3.2; or if the Contractor's Fee is stated as a fixed sum in Section 4.3.2 an amount which bears the same ratio to that fixed-sum Fee as the Cost of the Work included in Section 5.1.5.3.1.1 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.5.3.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;
- **.5** The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.5.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and
- **.6** Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5.4 The Owner, Construction Manager and Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.5.5 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor, and such action shall not be deemed to be a representation that (1) the Construction Manager and Architect have made a detailed examination, audit or arithmetic verification of the documentation submitted in accordance with Article 5 or other supporting data; (2) that the Construction Manager and Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager and Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.5.6 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.5.7 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.6 Progress Payments Where the Contract Sum is Based on the Cost of the Work with a Guaranteed Maximum Price

§ 5.1.6.1 With each Application for Payment, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Contractor's Fee.

§ 5.1.6.2 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Guaranteed Maximum Price among: (1) the various portions of the Work; (2) any contingency for costs that are included in the Guaranteed Maximum Price but not otherwise allocated to another line item or included in a Change Order; and (3) the Contractor's Fee.

§ 5.1.6.2.1 The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.6.2.2 The allocation of the Guaranteed Maximum Price under this Section 5.1.6.2 shall not constitute a separate guaranteed maximum price for the Cost of the Work of each individual line item in the schedule of values.

§ 5.1.6.2.3 When the Contractor allocates costs from a contingency to another line item in the schedule of values, the Contractor shall submit supporting documentation to the Architect and Construction Manager.

§ 5.1.6.3 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed; or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Contractor on account of that portion of the Work and for which the Contractor has made payment or intends to make payment prior to the next Application for Payment by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 5.1.6.4 In accordance with AIA Document A232-2019, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.4.1 The amount of each progress payment shall first include:

- **.1** That portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the most recent schedule of values;
- **.2** That portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction or, if approved in writing in advance by the Owner, suitably stored off the site at a location agreed upon in writing;
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and
- **.4** The Contractor's Fee, computed upon the Cost of the Work described in the preceding Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 at the rate stated in Section 4.4.2 or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work included in Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.6.4.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;

.5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.6.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.6 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.6.5 The Owner and the Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.6.6 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor and such action shall not be deemed to be a representation that (1) the Construction Manager or Architect have made a detailed examination, audit, or arithmetic verification of the documentation submitted in accordance with Section 5.1.6.1 or other supporting data; (2) that the Construction Manager or Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager or Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits, and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.6.7 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.6.8 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to when the Work of this Contract is substantially complete, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to when the entire Work of this Contract is substantially complete, including modifications for completion of portions of the Work as provided in Section 3.4.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, when the Work of this Contract is substantially complete, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted when the Work of this Contract is substantially complete shall not include retainage as follows:
(Insert any other conditions for release of retainage when the Work of this Contract is substantially complete, or upon Substantial Completion of the Work of all Contractors on the Project or portions thereof.)

§ 5.2 Final Payment

§ 5.2.1 Final Payment Where the Contract Sum is Based on a Stipulated Sum

§ 5.2.1.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect.

§ 5.2.1.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

§ 5.2.2 Final Payment Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 5.2.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment;

.2 the Contractor has submitted a final accounting for the Cost of the Work, pursuant to Exhibit B, Determination of the Cost of the Work and a final Application for Payment; and

.3 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect in accordance with Exhibit B, Determination of the Cost of the Work.

§ 5.2.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

§ 5.3 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

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ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Article 15 of AIA Document A232–2019, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A232–2019, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Article 15 of AIA Document A232–2019.

[ ] Litigation in a court of competent jurisdiction.

[ ] Other: *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.1.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019.

§ 7.2 Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 7.2.1 Termination

§ 7.2.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.2.1.2 Termination by the Owner for Cause

§ 7.2.1.2.1 If the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232–2019, the Owner shall then only pay the Contractor an amount as follows:

.1 Take the Cost of the Work incurred by the Contractor to the date of termination;

.2 Add the Contractor's Fee, computed upon the Cost of the Work to the date of termination at the rate stated in Section 4.3.2 or 4.4.2, as applicable, or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion;

.3 Subtract the aggregate of previous payments made by the Owner; and

.4 Subtract the costs and damages incurred, or to be incurred, by the Owner under Article 14 of AIA Document A232–2019.

§ 7.2.1.2.2 When the Contract Sum is based on the Cost of the Work with a Guaranteed Maximum Price, if the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232-2019, the amount, if any, to be paid to the Contractor under Article 14 of AIA Document A232-2019 shall not cause the Guaranteed Maximum Price to be exceeded, nor shall it exceed the amount calculated in Section 7.2.1.2.1.

§ 7.2.1.2.3 The Owner shall also pay the Contractor fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Contractor that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section 7.2.1.2.1.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Contractor shall, as a condition of receiving the payments referred to in this Article 7, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Contractor, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Contractor under such subcontracts or purchase orders. All Subcontracts, purchase orders and rental agreements entered into by the Contractor will contain provisions allowing for assignment to the Owner as described above.

§ 7.2.1.3 Termination by the Owner for Convenience
If the Owner terminates the Contract for convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of or method for determining the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.3 Suspension
The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019; in such case, the Contract Sum and Contract Time shall be increased as provided in Article 14 of AIA Document A232–2019, except that the term "profit" shall be understood to mean the Contractor's Fee as described in Section 4.3.2 or 4.4.2, as applicable, of this Agreement.

ARTICLE 8 MISCELLANEOUS PROVISIONS
§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232–2019 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds
§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A132™–2019, Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A232–2019, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Relationship of the Parties
Where the Contract is based on the Cost of the Work plus the Contractor's Fee, with or without a Guaranteed Maximum Price, the Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Contractor's skill and judgment in furthering the interests of the Owner; to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's interests. The Owner agrees to furnish and approve, in a timely manner, information required by the Contractor and to make payments to the Contractor in accordance with the requirements of the Contract Documents.

§ 8.8 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition

.2 AIA Document A132™–2019, Exhibit A, Insurance and Bonds Exhibit

.3 AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[ ] AIA Document A132™–2019, Exhibit B, Determination of the Cost of the Work

[ ] AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser Edition, dated as indicated below:
(Insert the date of the E235-2019 incorporated into this Agreement.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A232–2019 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

This Agreement is entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

AIA® Document A232™ – 2019

General Conditions of the Contract for Construction, *Construction Manager as Adviser Edition*

for the following PROJECT:
(Name, and location or address)

Police Station Addition to the
Caseyville Village Hall
909 S. Main Street
Caseyville, IL 62232

THE CONSTRUCTION MANAGER:
(Name, legal status, and address)

THE OWNER:
(Name, legal status, and address)

Village of Caseyville
909 S. Main Street
Caseyville, IL 62232

THE ARCHITECT:
(Name, legal status, and address)

AAIC inc.
One Design Mesa
Collinsville, IL 62234

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

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TABLE OF ARTICLES

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents. The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract. The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction Manager's consultants, (5) between the Owner and a Subcontractor or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their duties.

§ 1.1.3 The Work. The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project. The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by other Contractors, and by the Owner's own forces and Separate Contractors.

§ 1.1.5 Contractors. Contractors are persons or entities, other than the Contractor or Separate Contractors, who perform Work under contracts with the Owner that are administered by the Architect and Construction Manager.

§ 1.1.6 Separate Contractors. Separate Contractors are persons or entities who perform construction under separate contracts with the Owner not administered by the Architect and Construction Manager.

§ 1.1.7 The Drawings. The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.8 The Specifications. The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.9 Instruments of Service. Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.10 Initial Decision Maker. The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building

Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Construction Manager and the Architect do not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work, and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements,

assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. Unless otherwise provided under the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 The Owner shall retain a construction manager adviser lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 2.3.5 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.6 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.7 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3.8 The Owner shall forward all communications to the Contractor through the Construction Manager. Other communication shall be made as set forth in Section 4.2.6.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to review by the Construction Manager and prior approval of the Architect, and the Construction Manager or Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Construction Manager's and Architect's and their respective consultants' additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction

where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.5, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in such form as the Construction Manager and Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner, the Construction Manager, and the Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. The Construction Manager shall review the proposed alternative for sequencing, constructability, and coordination impacts on the other Contractors. Unless the Architect or the Construction Manager objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of the Project already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect, in consultation with the Construction Manager, and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner, Construction Manager, and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work or portions thereof provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices, and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit. The Contractor shall secure and pay for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or

(2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner, Construction Manager, and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect, in consultation with the Construction Manager, determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner, Construction Manager, and Contractor, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner, Construction Manager, and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents:

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect, through the Construction Manager, of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner, Construction Manager, or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information, and the Construction Manager's use in developing the Project schedule, a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Construction Manager's and Architect's approval. The Architect and Construction Manager's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Construction Manager and Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall participate with other Contractors, the Construction Manager, and the Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner, Construction Manager, and Architect, and incorporated into the approved Project schedule.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Construction Manager, Architect, and Owner, and delivered to the Construction Manager for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data, and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect and Construction Manager is subject to the limitations of Sections 4.2.10 through 4.2.12. Informational submittals upon which the Construction Manager and Architect are not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Construction Manager, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract

Documents, in accordance with the Project submittal schedule approved by the Construction Manager and Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Contractors, Separate Contractors, or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples, and similar submittals with related documents submitted by other Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner, Construction Manager, and Architect, that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been reviewed and approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Construction Manager and Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Construction Manager and Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner, the Architect, and the Construction Manager shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Construction Manager shall review submittals for sequencing, constructability, and coordination impacts on other Contractors.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Construction Manager and Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner, Separate Contractors, or of other Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner, Separate Contractors, or by other Contractors except with written consent of the Construction Manager, Owner, and such other Contractors or Separate Contractors. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Separate Contractors, other Contractors, or the Owner, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner, or Construction Manager with the Owner's approval, may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager, and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner, Construction Manager, and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner, Architect, or Construction Manager. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect through the Construction Manager.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 The Construction Manager is the person or entity retained by the Owner pursuant to Section 2.3.3 and identified as such in the Agreement.

§ 4.1.3 Duties, responsibilities, and limitations of authority of the Construction Manager and Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Construction Manager, Architect, and Contractor. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until the date the Architect issues the final Certificate for Payment. The Construction Manager and Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work.

§ 4.2.3 The Construction Manager shall provide one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner and Architect reasonably informed of the progress of the Work, and will promptly report to the Owner and Architect known deviations from the Contract Documents and the most recent Project schedule, and defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Contractors in accordance with the latest approved Project schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, and neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

§ 4.2.6 Communications. The Owner shall communicate with the Contractor and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and Construction Manager shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Construction Manager otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with other Contractors shall be

through the Construction Manager. Communications by and with the Owner's own forces and Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents, and will notify each other about the rejection. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, upon written authorization of the Owner, whether or not the Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 Utilizing the submittal schedule provided by the Contractor, the Construction Manager shall prepare, and revise as necessary, a Project submittal schedule incorporating information from other Contractors, the Owner, Owner's consultants, Owner's Separate Contractors and vendors, governmental agencies, and participants in the Project under the management of the Construction Manager. The Project submittal schedule and any revisions shall be submitted to the Architect for approval.

§ 4.2.10 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. Where there are other Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from the Contractor and other Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.11 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Construction Manager and Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Construction Manager and Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.13 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.14 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7, and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.15 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples, and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.16 The Construction Manager will assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.17 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Construction Manager of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.18 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of the Construction Manager, Owner, or Contractor through the Construction Manager. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.19 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions so rendered in good faith.

§ 4.2.20 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.21 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing, through the Construction Manager, to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include other Contractors or Separate Contractors or the subcontractors of other Contractors or Separate Contractors.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Construction Manager, for review by the Owner, Construction Manager and Architect, of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, that the Contractor, by these Contract Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor Contractor or other entity. If the Owner assigns the subcontract to a successor Contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor Contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction with Own Forces and to Award Other Contracts

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces or Separate Contractors, the Owner shall provide for coordination of such forces and Separate Contractors with the Work of the Contractor, who shall cooperate with them.

§ 6.1.3 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner's own forces, Separate Contractors, Construction Manager and other Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner's own forces, Separate Contractors or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Construction Manager and Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor or other Contractors that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Construction Manager and the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's or other Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractors or other Contractors that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a Separate Contractors or to other Contractors, because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of delays, improperly timed activities, damage to the Work or defective construction by the Owner's own forces, Separate Contractors, or other Contractors.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction, or to property of the Owner, Separate Contractors, or other Contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner, Separate Contractors, and other Contractors shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, other Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Construction Manager, with notice to the Architect, will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Construction Manager, Architect and Contractor. A Construction Change Directive requires agreement by the Owner, Construction Manager and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect, and Contractor, stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Construction Manager and signed by the Owner, Construction Manager and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Construction Manager and Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Construction Manager and Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Construction Manager and Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Construction Manager shall prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Construction Manager and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Construction Manager that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces, Separate Contractors, or other Contractors; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section

15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts and the Architect, based on the recommendation of the Construction Manager, determines justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Construction Manager, before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Construction Manager and the Architect. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and unless objected to by the Construction Manager or the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner, Construction Manager or Architect require, such as copies of requisitions, and releases of waivers of lien from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Construction Manager and Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all

Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Certificate for Payment, in the full amount of the Application for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 Where there is more than one Contractor performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives all of the Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Contractor's application with information from similar applications for progress payments from the other Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.2.1 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Project Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Project Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.3 The Construction Manager's certification of an Application for Payment or, in the case of more than one Contractor, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Application or Applications for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and data in the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.5 The representations made pursuant to Sections 9.4.3 and 9.4.4 are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Construction Manager or Architect.

§ 9.4.6 The issuance of a Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality

or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 and 9.4.4 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the acts and omissions described in Section 3.3.2 because of

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a Separate Contractor or other Contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect or Construction Manager withholds certification for payment under Section 9.5.1, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Construction Manager, and both will reflect such payment on the next Certificate for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment or Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Construction Manager and Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Construction Manager will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Owner, Construction Manager and Architect on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor

fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner, Construction Manager nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager's receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner, Construction Manager and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Construction Manager, and the Contractor and Construction Manager shall jointly prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the list, the Architect, assisted by the Construction Manager, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect, assisted by the Construction Manager, to determine Substantial Completion.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work of all of the Contractors, or designated portion thereof, is substantially complete, the Construction Manager will prepare, and the Construction

Manager and Architect shall execute, a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor and Construction Manager shall jointly prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance, and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection, and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Construction Manager's and Architect's final Certificate for Payment or Project Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6), if required by the Owner, other data

establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the Construction Manager prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor;
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction; and
- **.4** construction or operations by the Owner, Separate Contractors, or other Contractors.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner, Construction Manager and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner, Construction Manager and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Construction Manager, Architect, their consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of

tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Construction Manager and Construction Manager's consultants, and the Architect and Architect's consultants, shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice directly to the Owner, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the

Contract Documents, the Owner shall inform both the Contractor and the Construction Manager, separately and in writing, prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice directly to the Contractor, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Construction Manager and Construction Manager's consultants; (3) the Architect and Architect's consultants; (4) other Contractors and any of their subcontractors, sub-subcontractors, agents, and employees; and (5) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, other Contractors, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this Section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor, Architect, and Construction Manager for loss of use of the Owner's property, due to fire or other hazards however caused.

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to

requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Construction Manager, Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Construction Manager, Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion, and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner, Construction Manager or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner, Separate Contractors, or other Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Construction Manager, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become

requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Construction Manager, Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Construction Manager has not certified or the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees, or any other persons performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, after consultation with the Construction Manager, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and the Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of this Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Construction Manager and Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties, the Construction Manager, and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation

within 30 days of receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

SECTION 008002 - SUPPLEMENTAL GENERAL CONDITONS

SUPPLEMENTAL CONDITIONS TO AIA DOCUMENT A232
GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The "General Conditions of the Contract for Construction" – AIA Document A232, 2019 Edition, Articles 1 through 14 attached hereto (the "General Conditions") are hereby amended and supplemented (or voided), as hereinafter set forth and, except as hereby amended and supplemented (or voided) shall remain in full force and effect. The article, paragraph and subparagraph numbers set forth in these supplemental Conditions correspond to the article, paragraph and subparagraph numbers set forth in the General Conditions. Any term used herein with initial capital letters that is not otherwise defined herein shall have the same meaning ascribed to such term as defined in the General Conditions.

Article 1 – General Provisions

1. Article 1, Paragraph 1.2.1 is hereby amended by adding the following at the end thereof.

   "And an acknowledgement and agreement on the part of the Contractor that the information contained in the Contract Documents is adequate and sufficient for completion of the Work.

2. Article 1, Paragraph 1.5.1, the following shall be added as a new Paragraph 1.5.2 immediately following Paragraph 1.5.1.

   "Conflicts or discrepancies among the contract Documents shall be resolved in the following order of priority:

   1. The Supplementary Conditions;
   2. AIA A201/General Conditions;
   3. Drawings and Specifications; Drawings govern specifications for quantity and location; Specifications govern drawings for quality and performance; provided, in the event of any ambiguity in quantity or quality, the greater quantity and the better quality shall govern".

3. Article 1, Paragraph 1.5.2, the following shall be added as a new Paragraph 1.5.3 immediately following Paragraph 1.5.2

   "In the event of any unauthorized use, reuse or modifications to the Architect's Drawings, Specifications and other documents by the Contractor, or by any person or entity under the Contractor's direct employ, the Contractor shall and hereby agrees to indemnify, defend and hold harmless Owner, and Architect from and against any and all claims, suits, demands, losses and expenses whatsoever, including, without limitation, reasonable attorney's fees and all legal costs, expanses and fees incurred, accruing or resulting from such unauthorized use, reuse or modification."

4. Article 1, Add following new Paragraph.

   1.7 "CONFIDENTIALITY OF INFORMATION

1.71. Contractor agrees that, unless he secures the prior written consent of Owner, he shall not, either during the period of this agreement or at any time thereafter, divulge, use for the benefit of our make accessible to any person either (1) materials produced under this agreement, (2) information with respect to Owner, which he may have gained in the course of performing services or furnishing work product pursuant to this agreement, or the names of Owner.

1.7.2 Confidential Information. Each party acknowledges that, in connection with the performance of this Agreement, it may receive Confidential Information of the other party. For the purpose of this Agreement, “Confidential Information” shall mean information or materials that the party receiving the information (the “Receiving Party”) knows or has reason to know is the confidential or proprietary information of the party disclosing the information (the “Disclosing Party”), because such information is marked or otherwise identified by the Disclosing Party as confidential or proprietary. All parties are hereby notified that all documents furnished to or by AAIC inc. shall be considered “Confidential Information” as defined herein, including all drawings, specifications, submittals, and other Contract Documents.

1.7.3 Confidentiality. The Receiving Party hereby agrees: (1) to hold and maintain in strict Confidence and Confidential Information of the Disclosing party and not to disclose it to any third party; and (ii) not to use any Confidential Information of the Disclosing party except as permitted by this Agreement or as may be necessary for the receiving party to perform its obligations under this Agreement. The Receiving Party will use at least the same degree of care to protect the Disclosing Party’s Confidential Information as it used to protect its own Confidential Information of like importance.

1.7.4 Confidentiality Exceptions. Notwithstanding the foregoing, the parties agree that Confidential Information will not include any information that (1) was in the public domain at the time it was communicated to the receiving party by the Disclosing Party; (ii) entered the public domain subsequent to the time it was communicated to the Recipient by the Disclosing party through no fault of the receiving party; (iii) was in the Receiving Party’s possession free of any obligation of confidence at the time it was communicated to the Receiving party by the Disclosing Party; (iv) was rightfully communicated to the Receiving Party by a third party, free of any obligation of confidence, subsequent to the time it was communicated to the Receiving Party by the Disclosing Party; (v) was developed by employees or agents of the Receiving party independently of and without reference to any information communicated to the Receiving Party to an unaffiliated third party free of any obligation of confidence. In addition, the Receiving Party may disclose the Disclosing Party’s Confidential Information in response to a valid order by a court or other governmental body, as otherwise required by law, or as necessary to establish the rights of either party under this Agreement.

Article 2 – Owner

5. Article 2, Paragraph 2.2.3, Paragraph 2.2.3 is hereby amended by adding the phrase”, at the written request of the Contractor, and the extent in the possession of Owner, “before the work” “surveys” in the first line thereof.

6. Article 2, Paragraph 2.2.4, Paragraph 2.2.4 is hereby amended by inserting the following on the first line before information:

   "At the request of the Contractor, and to the extent reasonably necessary for the progress of the Work,"

Article 3 – Contractor

7. Article 3, Paragraph 3.2.4, the following new Paragraph 3.2.4 shall be added following Paragraph 3.2.3:

   "Prior to starting the work and with sufficient lead time to avoid any job schedules impact, Contractor shall review any specified construction and installation procedures and shall advise Owner and Architect, prior to commencing related activities, if any such procedure would result in finished work not in conformance with the intent of the Contract Documents.

8. Article 3, Paragraph 3.3.2, Paragraph 3.3.2 is hereby amended by adding the following after the phrase "and other persons" on the second lien thereof:

   "Or entities directly or indirectly employed by them"

9. Article 3, Paragraph 3.6., Taxes 3.6 is hereby amended by deleting the entire paragraph starting with the first word "The" and ending with the last word effect and inserting the following:

   "All federal taxes, State of Illinois taxes and City taxes shall be excluded from the Bid sum.

10. Article 3, Paragraph 3.9.1, Paragraph 3.9.1 is hereby deleted in its entirety and the following substituted in lieu thereof:

    "The Contractor shall employ a competent superintendent who shall be in attendance at the Project site during performance of Work. The superintendent shall be approved by the Architect and Owner and shall not be replaced without the Architects prior written approval. The superintendent shall be familiar with the job site, the Contract Documents and all applicable laws, ordinances, rules, codes, orders and regulations of all authorities having jurisdiction over the work and/or the site. The superintendent shall represent the Contractor and all communication given to the superintendant shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing.

11. Article 3, Paragraph 3.10.3, Paragraph 3.10.3. is hereby amended by adding the following at the end thereof:

    "3.10.3, Failure of the Contractor to submit or keep current the construction schedule and submittals schedule as required by the conditions of the Work shall be grounds for withholding of payments due to the Contractor by the Owner until such schedule or submittals are provided and approved."

12. Article 3, Paragraph, 3.11., DOCUMENTS AND SAMPLES AT THE SITE is hereby amended by adding the phrase, “as well as one copy of the approved permit set” following the word “Modifications” on the second line thereof.

13. Article 3, Paragraph, 3.12.8, Paragraph 3.12.8 is hereby amended by adding the words “or omissions” immediately after the word “deviations” on the second line thereof, and by adding the words “or omission” immediately after the word “deviation” on the forth line thereof:

14. Article 3, Paragraph 3.15.1, Paragraph 3.15.1 is hereby amended by adding the phrase “at all times” immediately following the word “shall” on the first lien thereof.

15. Article 3, Paragraph 3.16., ACCESS TO WORK is hereby amended by adding the phrase “all portions of” immediately following the words “access to” on the first line thereof.

16. Article 3, Paragraph 3.17.2 the following new Paragraph 3.17.2 is hereby added immediately following Paragraph 3.17.1:

    “3.17.2 The Contractor agrees that all right, title and interest in and to all materials produced by Contractor under this agreement, alone or in combination with Owner and/or its employees or other agents, shall be the sole property of Owner, which may use or authorize others to use such materials with or without attribution. The extent provided for under applicable law, all such materials shall be considered works made for hire, and their exclusive ownership shall vest with owner upon their creation. The extent any such materials may not be considered works made or hire under applicable law, Contractor hereby assigns all right, title and interest in and to all such materials to Owner and affiliates at the time of their creation, without the necessity of further consideration. Contractor agrees to assist Owner at its expense to register and/or record any such rights with the appropriate authorities. To the extent any materials produced by Contractor.

Article 11 - Insurance and Bonds

17. Article 11, Paragraph 11.1.2, add the following new Paragraphs to the end of the existing Paragraph 11.1.2:

    “Contractor shall notify Owner of any notice received or knowledge acquired by Contractor of any cancellation or threat of cancellation of any policy issued. Said Notice shall be given in no less than thirty (30) working Days from receipt of such Notice or knowledge. Failure to so notify Owner shall constitute an Event of Default of the Contract. Upon receipt of Notice or acquiring knowledge of cancellation of any policy issued to meet the requirements herein, Owner may terminate the Contract or may prohibit Contractor from proceeding with or completing the Work until such time as Contractor has provided Owner with a certificate of insurance as required under this provision.”

18. Article 11, Paragraph 11.1.3, add the following new Paragraphs to the end of the existing Paragraph 11.1.3:

    “The failure to provide or replace certificates of insurance, the providing of a certificate of insurance that fails to meet any requirement of paragraph 11.1.1, or the failure of Owner to enforce any aspect of paragraph 11.1.1, shall not be construed as a waiver or limitation on the part of Owner to insist upon full compliance with paragraph 11.1.1, nor shall it

be construed to limit or relieve the Contractor of any liability arising out of or associated with the Contractor's performance of the Contract, including the obligation of the Contractor to provide the required insurance at the required policy limits."

19. Article 11, Add the following new Paragraphs 11.1.5:

"Each policy required by Contractor of paragraph 11.1.1 shall be endorsed to require the insurer to give Owner at least thirty (30) Days advance written Notice of the insurer's intention to cancel or refuse to renew any coverage under the policy. Copies of endorsements to the policies indicating this provision shall be supplied by Contractor prior to commencement of the Work. Upon receipt of any Notice of cancellation or termination of coverage, Contractor shall, within thirty (30) Days, procure other policies of insurance that are in accordance with terms of the Contract, and deliver evidence of coverage that these are in full force and effect, and if Contractor fails to provide and deliver acceptable policies, or satisfactory evidence thereof, then at Owner's option Owner may obtain such insurance at the cost and expense of Contractor, without the need of any Notice to Contractor."

20. Article 11, Add the following new Paragraphs, 11.1.6:

"The Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the project is located, builders risk insurance in the amount of the initial contract amount plus values of subsequent modifications, change orders, and loss of materials supplied or installed by others comprising the value of the entire project at the site on a replacement cost basis without optional deductibles. Such builders risk insurance shall be maintained, unless otherwise provided in the contract documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made or until no person or entity other than Owner has insurable interest in the property to be covered, whichever is earlier. The builders risk insurance shall include interests of Owner, the general contractor, subcontractors, and sub-tier contractors in the project."

21. Article 11, Add the following new Paragraphs 11.1.7:

"The builders risk coverage shall be written on a Special Covered Cause of Loss form and shall include theft; vandalism; malicious mischief; collapse; false-work; temporary buildings; transit; debris removal, including demolition; increased cost of construction; architect fees and expenses; soft costs; flood, including water damage; earthquake; and, if applicable, all below and above ground structures; piping; foundations, including underground water and sewer mains; piling, including the ground on which the structure rests; and excavation, backfilling, filling, and grading. The builders risk shall include a Beneficial Occupancy Clause. The policy shall specifically permit occupancy of the building during construction. The Contractor shall take reasonable steps to obtain consent of the insurance company and delete any provisions with regard to restrictions within any occupancy clauses within the builders risk policy. The builders risk policy shall remain in force until acceptance of the project by the Owner. The Owner's insurance coverage shall be primary insurance and non-contributory with respect to all other available sources. Waiver of Subrogation is to apply against all parties named as insured, but only to the extent the loss is covered."

END OF SECTION 008002

SECTION 00 81 00 - BEP PARTICIPATION

It is the policy of the Owner that minority/female owned businesses shall have the maximum feasible opportunity to participate in the performance of contracts initiated for this Project.

It is Owner's requirement to achieve, as a minimum, a participation of the combination of nineteen percent (19%) minority/ female-owned business enterprises.

The Owner will only accept Minority and Female Business Enterprise (MBE/FBE) firms certified by the Illinois Department of Central Management Services (CMS) as a MBE or FBE. The MBE/FBE's certification/registration with CMS shall be in good standing prior to the bid opening date.

Each bidder shall name the minority and female owned businesses it intends to use to meet the specified goals. If the specified goals are not met, the bidder shall submit with its bid a request for change/waiver of MBE/FBE goals or, within 7 (seven) calendar days of the bid opening, submit documentation of its good faith efforts to achieve the goals.

If the bidder is a minority or female or veteran owned business, indicate by stating "Bidder is an MBE/FBE firm" next to the firm name of the bid form. The owner encourages MBE/FBE prime bidders to use MBE/FBE subcontractors/suppliers.

If the bidder is a joint venture, the percentage of ownership held by the MBE/FBE joint venturer may be used to meet the MBE/FBE goal for the contract.

Subcontracting of work to a lower tier non-MBE/FBE firm which would reduce the proceeds received by the subcontracting MBE/FBE firm below the specified goal is prohibited. The owner may, in such cases, reject the bid or terminate the contract.

If submittal of Good Faith Effort documentation or change waiver request is in order, include with the package:

A. All information indicating why the specified goal cannot be met.

B. A list of all MBE/FBE firms contacted and the dates they were contacted, including documentation from those firms.

C. Copies of all bid solicitation letters to MBE/FBE firms. Letters shall contain, as a minimum:

   1) Project Title and Location
   2) Classification of Work Items for Which Quotations are Requested
   3) Date, Time, and Place Quotations are Due
   4) Returnable Acknowledgment of the Solicitation

D. Evidence, such as a log, of telephone contact including time and date of call, telephone number, and name of the person called.

E. All other evidence of good faith efforts made by the bidder to secure eligible MBE/FBE firms to meet the specified goal. Evidence may include documentation that states the

following:

1) A reasonable number of MBE/FBE firms were contacted.
2) The work selected by the bidder for allocation to MBE/FBE firms was selected in order to increase the likelihood of achieving the specified goal.
3) The bidder negotiated, in good faith, with the potential MBE/FBE firms by not imposing any conditions which are not similarly imposed on all other subcontractors and suppliers, or by denying benefits ordinarily conferred on subcontractors or suppliers for the type of work for which bids were solicited.
4) The services of the referral agencies were used by the bidder in efforts to achieve the specified goal.
5) The bidder attended the mandatory pre-bid meeting for the project.

F. Other relevant information in support of the change/waiver request.

If it can be demonstrated that the MBE/FBE subcontractor or supplier cannot perform the work, or if a MBE/FBE loses its CMS certification/registration after the bid opening, then the Contractor shall make a good faith effort to replace, in-kind, the MBE/FBE. The contractor shall identify the replacement MBE/FBE or provide evidence of good faith effort to find a replacement on the Contractor's letterhead and submit with documented evidence of cause to the Owner. The Owner will review submittal and may, at its sole discretion, authorize the replacement or approve the good faith effort.

Calculation of MBE/FBE Participation as a Material Supplier or Subcontractor

A. MBE/FBE as a material supplier: A 100 percent goal credit is allowed for the cost of materials or purchases from a MBE/FBE regular dealer.
B. MBE/FBE as a subcontractor: A 100 percent goal credit is allowed for the work of the subcontract performed by the MBE/FBE's own forces (performing, managing and supervising the work), including the cost of materials and supplies, excluding the purchase of materials and supplies or the lease of equipment by the MBE/FBE subcontractor from the prime Contractor or its affiliates. Work that a MBE/FBE subcontractor in turn subcontracts to a non-MBE/FBE does not count toward the MBE/FBE goal.

Contractor agrees to make every effort to meet or exceed this MBE/FBE participation policy through award of subcontracts to minority/women's business enterprises to fullest extent consistent with the efficient performance of this contract.

Failure to meet requirement may be cause for rejection of bid.

See following pages for BEP Utilization Plan that will need to be completed upon request of the owner. Fillable PDF will be provided to successful contractors for completion.

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UTILIZATION PLAN PART I: COMMITMENT AND SIGNATURE

The undersigned Vendor submits this Utilization Plan as part of its bid or offer in accordance with the requirements of solicitation # _____ and the requirements of the Business Enterprise Program (BEP). The solicitation contains a goal that _____% of the value of the contract will be performed by BEP certified vendors as defined by the Department of Central Management Services (CMS). The solicitation contains a goal that _____% of the value of the contract will be performed by Veteran Small Business certified vendors (VSB) as defined by the Department of Central Management Services.

The Utilization Plan consists of the following parts, each of which must be completed and returned as instructed in this Commitment. No alterations of these forms will be permitted. One set of Parts I-IV must be completed for the BEP goal and one set must be completed for the VSB goal:

Part I: Vendor Commitment (with Signature)
Part II: Subcontractor Participation Agreement(s)
Part III: Good Faith Effort (Checklist, Contact Log, and Documentation)
Part IV: Utilization Plan Terms and Conditions (These terms and conditions apply to all options below but do not need to be returned.)

The undersigned Vendor acknowledges that (1) Vendor has read, understands, and agrees to BEP policies, rules, and procedures as defined in the Terms and Conditions in Part IV of this document, and (2) Vendor hereby affirms (**select one** of the options below):

☐ Vendor is a BEP certified firm and plans to fully meet the goal through self-performance or Vendor is a VSB certified firm and plans to fully meet the VSB goal through self-performance. (Return this Part I Signature Page only.)

☐ Vendor has identified BEP and VSB certified subcontractor(s) to fully meet the established BEP and VSB goals. Only BEP certified subcontractors may be used to meet the BEP goal and only VSB certified subcontracts may be used to meet the VSB goal if Vendor intends to meet the established goal in whole or in part through the use of subcontractors. Subcontractors that are both BEP and VSB certified may only be counted towards the BEP or VSB goal. (Return this Part I Signature page and signed Part II Subcontractor Participation Agreement(s) to equal or exceed the goal.)

☐ Vendor cannot fully meet the goal but has made Good Faith Effort towards meeting the goal, and hereby requests a waiver or reduction of the goal to _____% based on the completed Good Faith Effort. (If requesting a waiver, return this Part I Signature Page and completed Part III Good Faith Effort. If requesting a reduction, return this Part I Signature Page, Part II signed Subcontractor Participation Agreement(s), and completed Part III Good Faith Effort.)

The undersigned Vendor understands that all subcontractors identified in this Utilization Plan and Participation Agreement(s) must be certified with the Illinois Department of Central Management Services (CMS) BEP at the time of submission of all bids/offers and shall perform commercially useful functions as defined in Part IV of this Utilization Plan. **We understand that compliance with this Utilization Plan is a mandated part of this solicitation and that this Utilization Plan will become a**

part of the contract, if awarded. Failure to carry out the requirements of this Utilization Plan is a material breach of the resulting contract, which may result in the termination of the contract or such other remedy as the Agency/University deems appropriate.

Vendor Name and d/b/a: _____

Signature:_____ Print: _____Title:_____
Email Address: _____ Telephone: _____

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UTILIZATION PLAN PART II: PARTICIPATION AGREEMENT (Letter of Intent)

Instructions: The Prime Vendor is required to submit a separate, signed and **fully completed Participation Agreement** from each Business Enterprise Program (BEP) certified vendor or Veteran Small Business certified vendor (VSB). **Once signed and submitted with the bid/offer, this Participation Agreement, along with the other Parts of this Utilization Plan, will become a mandated part of the contract, if awarded.** The Prime Vendor shall not prohibit or otherwise limit the BEP/VSB certified vendor(s) from providing subcontractor quotes to other potential bidders/offerors.

Project Name: _____ **Project/Solicitation Number:** _____

Name of Prime Vendor: _____
Address: _____
City, State and Zip: _____
Telephone: _____ Fax: _____ Email: _____

Vendor's Contact responsible for compliance with this Participation Agreement:
_____

Name of BEP/VSB Certified Vendor: _____
Type of Certified Vendor: [ ] BEP [ ] VSB
Address: _____
City, State and Zip: _____
Telephone: _____ Fax: _____ Email: _____

BEP/VSB Vendor's Contact responsible for compliance with this Participation Agreement:
_____

Type of Agreement: [ ] Services [ ] Supplies [ ] Both Services and Supplies

(a) Proposed % of Contract to be performed by the BEP/VSB Certified Vendor _____%
NOTE: The Prime Vendor must indicate the percentage of the estimated contract award that will be subcontracted to the certified BEP/VSB Vendor.

(b) Anticipated start date of the Certified BEP/VSB Vendor: _____.

(c) This participation agreement shall have a term of _____ to _____, with a total period of ____ years and ____ months, including renewals, change orders or extensions to the underlying contract.

(d) Description of work to be performed or goods/equipment to be provided by the BEP certified vendor. **This description must include identified Institute for Public Procurement (NIGP) Class or Class Item codes**. All Participation Agreements shall be subject to Agency/University approval. Any changes involving or affecting the identified BEP/VSB certified vendor, scope(s)

of work and NIGP Code(s) will not be permitted without notification to the soliciting Agency/University and BEP/VSB Compliance, in writing, and approval of the soliciting Agency/University. (*If more space is needed to fully describe BEP/VSB certified firm's proposed scope of work and/or payment schedule, attach additional sheets)*

THE UNDERSIGNED PARTIES FURTHER AGREE that once signed and submitted with the bid/offer, this Participation Agreement, along with the other Parts of this Utilization Plan, will become a material part of the contract, and the BEP/VSB certified vendor will perform the scope of work for the percentage as indicated above. The Undersigned Parties do also certify that they did not affix their signatures to this document until all areas under Description of Service/ Supply and Fee/Cost were completed.

_____	_____
Vendor (Company Name and d/b/a):	Certified BEP/VSB (Company Name and d/b/a):
_____/ _____	_____/_____
Name (Signature) Date	Name (Signature) Date
_____	_____
Name (Print)	Name (Print)
_____	_____
Title	Title

UTILIZATION PLAN PART III: DEMONSTRATION OF GOOD FAITH EFFORTS TO ACHIEVE GOAL AND REQUEST FOR WAIVER

If the BEP/VSB participation goal will not be achieved in whole or part, the Good Faith Efforts Procedures outlined in Parts III and IV of this document will be used to evaluate submitted Utilization Plans. A Vendor providing Good Faith Effort documentation and a request for waiver must complete and submit Part III of this Utilization Plan in its entirety in addition to its bid/offer. Failure to submit the Good Faith Effort Contact Log, checklist, and supporting documentation in its entirety shall render Vendor's bid or offer non-responsive and cause it to be rejected.

Below is a checklist of actions that will be used to evaluate a Vendor's Demonstration of Good Faith Efforts and Request for Waiver. **Please check the actions which you have completed.** If any of the following actions are not completed, please attach a detailed written explanation indicating why such action was not completed. If any other efforts were made to obtain BEP certified vendor participation, in addition to the items listed below, attach a detailed description of such efforts.

☐ Utilize the website: https://cms.diversitycompliance.com to identify BEP/VSB certified vendors within the respective NIGP Class or Class Item code(s) on the solicitation documents. At a minimum, email all listed vendors with project specifications sufficient to build a quote, then solicit quotes from all vendors who express an interest with follow-up emails and telephone calls. Documentation of these efforts must be submitted as evidence, including copies of all e-mails sent.

☐ Solicit through all reasonable and available means (e.g., attendance at a vendor conference, advertising, written notices) the interest of BEP/VSB certified vendors that have the capability to perform the work of the contract. Vendor must solicit this interest with sufficient advance time to allow the BEP/VSB certified vendors to respond to the solicitation. Vendor must determine with certainty if the BEP/VSB certified vendors are interested by taking appropriate steps to follow up initial solicitations and encourage them to submit a bid or proposal, providing them with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding promptly to the solicitation.

☐ Select portions of the work to be performed by BEP/VSB certified vendors to increase the likelihood that the goal will be achieved. This includes, where appropriate, unbundling contract work items into economically feasible units to facilitate BEP/VSB certified vendor participation, even when Vendor might otherwise prefer to perform these work items with its own forces.

☐ Make a portion of the work available to BEP/VSB certified vendors by selecting portions of the work or needed material based on the availability of BEP/VSB vendors.

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☐ Negotiate in good faith with interested BEP/VSB certified vendors. Evidence of such negotiation must include the contacted names, mailing addresses, email addresses, and telephone numbers of BEP/VSB certified vendors that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for BEP certified vendors to perform the work. A Vendor using good business judgment may consider many factors in negotiating with BEP/VSB certified vendors and may take a firm's price and capabilities into consideration. The fact that there may be some additional costs involved in finding and using BEP/VSB certified vendors may not, in itself, be a sufficient reason for a Vendor's failure to meet the goal, as long as such costs are reasonable. Vendors are not required to accept higher quotes from BEP/VSB certified vendors if the price difference is excessive or unreasonable.

☐ Thoroughly investigate the capabilities of BEP/VSB certified vendors and do not reject them as unqualified without documented reasons. BEP/VSB certified vendors' memberships in specific groups, organizations, associations or political/social affiliations are not legitimate causes for the rejection or non-solicitation of bids and proposals in Vendor's efforts to meet the goal.

☐ Where subcontractor capacity and/or access to capital prevents participation, make efforts to assist in obtaining available resources such as State of Illinois lending programs and the prime's lending, capital and bonding networks.

☐ Make efforts to assist interested BEP/VSB certified vendors in obtaining necessary equipment, supplies, materials, and related assistance or services.

☐ Follow best practices when conducting a Good Faith Effort. Best practices can be found on the BEP website at https://www2.illinois.gov/cms/business/sell2/bep/Pages/Business_Resources.aspx.

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GOOD FAITH EFFORTS CONTACT LOG

Use this log, if you are requesting a Good Faith Effort waiver, to document **all** contacts and responses (i.e., telephone, email, fax, etc.) regarding the solicitation of BEP/VSB certified vendors for the scope of work within the specific NIGP Class Item commodity/service code(s) selected. It is not necessary to show contacts with BEP certified vendors who are identified on the Participation Agreement(s). **Keep and submit copies of all emails sent and received from prospective BEP/VSB vendors. Include a copy of the NIGP Class and Class Item commodity/service code list and/or scope of work you used to solicit prospective BEP/VSB vendors to perform.** Duplicate this Log as necessary. Do not limit your contacts to the number of spaces shown below. **The Agency/University established the BEP/VSB goal in the solicitation using NIGP Class and Class Item commodity/service code(s) representing the scope of work. All BEP/VSB certified vendors identified by these NIGP Class and Class Item commodity/service code(s) must be contacted by email and phone to satisfy the Good Faith Effort requirements.** Vendors are found in the NIGP Class and Class Item commodity/service code(s) search on the BEP/VSB Vendor Database located at https://cms.diversitycompliance.com.

Agency/University Supplied NIGP Class and Class Item Codes (Required):	***Other NIGP Class and Class Item Codes Utilized by Vendor (Optional):**

*"Other NIGP Class and Class Item Codes Utilized by Vendor" may only be utilized to obtain a Participation Letter, **not** Good Faith Effort Documentation.

Certified BEP/VSB Vendor Name	Name of Person Contacted	Date	Contact Method	Scope of Work Solicited/ NIGP Class and Class Item Commodity/ Service Code(s)	Reason Agreement Was Not Reached

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UTILIZATION PLAN PART IV: TERMS OF UTILIZATION

DEFINITIONS:

“Agency” shall be defined as any State Agency, Board, or Commission under the jurisdiction of the Governor of the State of Illinois.

“University” shall be defined as any University, Department, public institution of higher education, and/or community college district within the State of Illinois.

"Business owned by a person with a disability” or “PBE" means a business concern that is at least 51% owned by one or more persons with a disability and the management and daily business operations of which are controlled by one or more of the persons with disabilities who own it. A not-for-profit agency for persons with disabilities as defined in Section 45-35 of the Illinois Procurement Code is also considered a "business owned by a person with a disability."

"Certification" means a determination made by the Council or by one delegated authority from the Council to make certifications, or by a State agency with statutory authority to make such a certification, that a business entity is a business owned by a minority, woman, or person with a disability for whatever purpose. A business owned and controlled by women shall be certified as a "woman owned business". A business owned and controlled by women who are also minorities shall be certified as both a "woman owned business" and a "minority owned business".

"Commercially Useful Function" means responsibility for the execution of a distinct element of the work of the contract, which is carried out by actually performing, managing, and supervising the work involved, evidencing the responsibilities and risks of a business owner such as negotiating the terms of (sub)contracts, taking on a financial risk commensurate with the contract or its subcontract, responsibility for acquiring the appropriate lines of credit and/or loans, or fulfilling responsibilities as a joint venture partner as described in the joint venture agreement.

“Compliance” means that a contractor has correctly implemented the requirements of this Utilization Plan.

“Contract Specific Goals” means the goals established under the Agency/University’s supplier diversity program that are based upon relevant factors, including, but not limited to, the availability of diverse businesses in the scopes of work of the contract.

“Contractor” means any person or business entity that has entered into a contract with the Agency/University, and includes all partners, affiliates, and joint ventures of such person or entity.

"Control" means the exclusive or ultimate and sole control of the business including, but not limited to, capital investment and all other financial matters, property, acquisitions, contract negotiations, legal matters, officer-director-employee selection and comprehensive hiring, operating responsibilities, cost-control matters, income and dividend matters, financial transactions and rights of other shareholders or joint partners. Control shall be real, substantial and continuing, not pro forma. Control shall include the power to direct or cause the direction of the management and policies of the business and to make the day-to-day as well as major decisions in matters of policy, management and operations. Control shall be exemplified by possessing the requisite knowledge

and expertise to run the particular business and control shall not include simple majority or absentee ownership.

"Council" means the Business Enterprise Council for Minorities, Women and Persons with Disabilities.

"Diverse Firms" shall mean businesses owned by minorities, women, and persons with disabilities. Also to include, qualified service-disabled veteran-owned small businesses and qualified veteran-owned small businesses.

"Woman" shall mean a person who is a citizen or lawful permanent resident of the United States and who is of the female gender.

"Woman-owned business" of "WBE" means a business concern which is at least 51% owned by one or more women, or, in the case of a corporation, at least 51% of the stock in which is owned by one or more women; and the management and daily business operations of which are controlled by one or more of the women who own it.

"Good Faith Efforts" means actions undertaken by a bidder or contractor to achieve a Contract Specific Goal by its scope, intensity, and appropriateness to the objective, that can reasonably be expected to fulfill the program's requirements.

"Joint Venture" means an association of a diverse firm and one or more other firms to carry out a single, for-profit business enterprise, for which each joint venture partner contributes property, capital, efforts, skills and knowledge, and in which the diverse firm is responsible for a distinct, clearly defined portion of the work of the contract and whose share in the capital contribution, control, management, risks, and profits of the joint venture are commensurate with its ownership interest.

"Manufacturer" refers to a company that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described by the specifications.

"Minority-owned business" or "MBE" means a business concern which is at least 51% owned by one or more minority persons, or in the case of a corporation, at least 51% of the stock in which is owned by one or more minority persons; and the management and daily business operations of which are controlled by one or more of the minority individuals who own it.

"Minority person" shall mean a person who is a citizen or lawful permanent resident of the United States and who is any of the following:

(a) American Indian or Alaska Native (a person having origins in any of the original peoples of North and South America, including Central America, and who maintains tribal affiliation or community attachment).

(b) Asian (a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent, including, but not limited to, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam).

(c) Black or African American (a person having origins in any of the black racial groups of Africa). Terms such as "Haitian" or "Negro" can be used in addition to "Black or African American".

(d) Hispanic or Latino (a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race).

(e) Native Hawaiian or Other Pacific Islander (a person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands).

“NIGP Class and Class Item Codes” identify the scope(s) of work as defined by the National Institute of Governmental Procurements. This five-digit code establishes and defines the detailed scope(s) of work for the contract. The first three digits of the NIGP code represents the Class or broad category of the work to be performed, and the second two digits of the NIGP code identify a more specific focus of work within the Class category.

“Owned” means having all the customary incidents of ownership, including the right of disposition, and the sharing in all risks and profits commensurate with the degree of ownership interest.

"Person with a disability" means a person who is a citizen or lawful resident of the United States and is a person qualifying as being disabled under subdivision (Illinois Compiled Statutes 30 ILCS 575/2 subsection A).

"Qualified service-disabled veteran" means a veteran who has been found to have 10% or more service-connected disability by the United States Department of Veterans Affairs or the United States Department of Defense.

"Qualified service-disabled veteran-owned small business" or "SDVOSB" means a small business (i) that is at least 51% owned by one or more qualified service-disabled veterans living in Illinois or, in the case of a corporation, at least 51% of the stock of which is owned by one or more qualified service-disabled veterans living in Illinois; (ii) that has its home office in Illinois; and (iii) for which items (i) and (ii) are factually verified annually by the Department of Central Management Services.

"Qualified veteran-owned small business" or "VOSB" means a small business (i) that is at least 51% owned by one or more qualified veterans living in Illinois or, in the case of a corporation, at least 51% of the stock of which is owned by one or more qualified veterans living in Illinois; (ii) that has its home office in Illinois; and (iii) for which items (i) and (ii) are factually verified annually by the Department of Central Management Services.

“Regular Dealer” means a business that owns, operates, or maintains a store, warehouse, or other establishment in which the supplies, equipment, or goods (excluding software licenses) of the general character required for the Procurement are bought, kept in stock, and regularly sold or leased in the usual course of business. To be a Regular Dealer, the business must be an established business that engages, as its principal business and under its own name, in the Procurement and sale or lease of the products in question. A business may be a Regular Dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business if the business both owns and operates distribution equipment

for the products. Any supplementing of such business' distribution equipment shall be by a long-term lease agreement and not on an ad hoc or contract-by-contract basis. Packagers, manufacturer representatives, or other businesses who arrange or expedite transactions are not Regular Dealers.

"State contracts" means all contracts entered into by the State, any agency or department thereof, or any public institution of higher education, including community college districts, regardless of the source of the funds with which the contracts are paid, which are not subject to federal reimbursement. "State contracts" does not include contracts awarded by a retirement system, pension fund, or investment board subject to Section 1-109.1 of the Illinois Pension Code. This definition shall control over any existing definition under this Act or applicable administrative rule.

"Supplier" refers to a company that owns, operates, or maintains a store, warehouse or other establishment in which materials, supplies, articles or equipment are bought, kept in stock and regularly sold or leased to the public in the usual course of business. A regular distributor or supplier is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials or supplies required for performance of a contract are bought, kept in stock, and regularly sold to the public in the usual course of business. To be a regular distributor the firm must engage in, as its principal business and in its own name, the purchase and sale of the products in question. A regular distributor in bulk items such as steel, cement, gravel, stone, and petroleum products need not keep such products in stock if it owns or operates distribution equipment.

"Utilization Plan" means a form and additional documentation included in all bids or proposals that demonstrates a vendor's proposed utilization of vendors certified by the Business Enterprise Program to meet the targeted goal. The Utilization Plan shall demonstrate that the Vendor has either: (1) met the entire contract goal or (2) requested a full or partial waiver and made Good Faith Efforts towards meeting the goal.

Business Enterprise Program Aspirational Goal

The Business Enterprise for Minorities, Women, and Persons with Disabilities Act, 30 ILCS 575, establishes an aspirational goal of awarding not less than 20% of the total dollar amount of State contracts to businesses certified as owned and controlled by minorities, women, and persons with disabilities. 30 ILCS 575/4(a).

Section 45-75 of the Illinois Procurement Code, 30 ILCS 500, establishes a goal to award not less than 3% of the total dollar amount of State contracts to SDVOSBs and VOSBs.

This solicitation includes Business Enterprise Program (BEP) and/or Veterans Business Program participation goals and, therefore, requires bidders and offerors to include a BEP Utilization Plan and a VSB Utilization Plan. A "Utilization Plan" includes the form on page 1 of this document, with the Participation Agreement and Schedule(s); any additional documentation required in the instructions that demonstrates a commitment to utilizing certified BEP/VSB subcontractors to meet the targeted, contract-specific goal, described below; and documentation demonstrating Good Faith Effort when requesting a goal waiver or reduction.

STATE OF ILLINOIS BUSINESS ENTERPRISE PROGRAM
UTILIZATION PLAN

A properly completed BEP Utilization Plan and VSB Utilization Plan is due at the time of bid or offer submission. Failure to complete and include a BEP Utilization Plan shall render a bid or offer non-responsive. 30 ILCS 575/4(f). Non-responsive bids and offers will be rejected by the Agency/University.

In addition to the other award criteria established for this solicitation, the Agency/University will award this contract to a Vendor that meets the contract-specific goal or makes Good Faith Efforts to meet the goal. The goal is applicable to the contract, amendments, modifications, extensions, change orders, and allowances. The Vendor's Utilization Plan must indicate whether the goal will be met by self-performance or by subcontracting. If the prime Vendor is BEP certified, the entire goal can be met by Prime Vendor self-performance, without subcontracting with another certified BEP vendor. If the prime Vendor is VSB certified, the entire VSB goal can be met by Prime Vendor self-performance. However, the prime BEP or VSB Vendor must submit a Utilization Plan indicating that the goal will be met by self-performance**.** If a prime Vendor subcontracts any portion of a contract to non-BEP/VSB certified subcontractors, the amount paid for goods or services delivered by those subcontractors will not be counted toward the goal.

Contract (Specific) Goal to be Achieved by Vendor
This solicitation includes a contract-specific BEP/VSB participation **goal** based on certified BEP/VSB vendors available to perform anticipated services and/or provide supplies required by this solicitation. The availability of certified BEP/VSB vendors was determined using The Institute for Public Procurement (NIGP Class and Class Item) codes listed in the Invitation for Bid (IFB), Request for Proposal (RFP), Request for Qualifications (RFQ), or other solicitation documents.

Prime Vendors must only consider NIGP Class and Class Item codes referenced in solicitation documents when selecting BEP/VSB subcontractors or completing a Good Faith Effort. Subject to State Agency/University approval, the Prime Vendor may utilize additional codes to identify BEP/VSB vendors that will be able to perform a commercially useful function under the resulting contract through direct participation. Indirect participation will not be considered towards BEP/VSB goals. Direct participation includes work that is directly related to the completion of the scope of work of the contract. Indirect participation includes work related to other aspects of the Contractor's business. The NIGP Class and Class Item codes listed in the solicitation documents, as well as any additional codes selected by the Prime Vendor and approved by the contracting Agency/University, must be entered in Part II: Participation Agreement and Part III: Good Faith Effort Log sections of this Utilization Plan. Bidders seeking a Good Faith Effort waiver or goal reduction must contact **all** BEP/VSB vendors identified for respective NIGP Class and Class Item commodity/service codes listed in the solicitation documents.

The Prime Vendor must also enter into the Participation Agreement its plan to utilize each BEP/VSB subcontractor, including: (a) the proposed percentage of the contract to be performed by each BEP/VSB subcontractor; (b) the anticipated start date for each BEP/VSB subcontractor; (c) the anticipated dates and time periods of utilization of each BEP/VSB subcontractor; and (d) a detailed description of the work to be performed by each BEP/VSB subcontractor, including identified NIGP Class and Class Item commodity/service codes.

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UTILIZATION PLAN

This Utilization Plan must demonstrate that the prime Vendor has either: (1) met the entire contract goal; or (2) requested a full waiver and made Good Faith Efforts towards meeting the entire goal; or (3) requested a goal reduction and made Good Faith Efforts towards meeting a portion of the goal. Submission of Good Faith Effort log and appropriate documentation by Vendor shall be considered as a request for a full or partial goal waiver.

For a Utilization Plan to be considered, at the time of bid or offer, the submitting prime BEP/VSB vendor, if self-performing, or non-BEP/VSB submitting prime Vendor's proposed BEP/VSB subcontractor(s), must be certified with the Illinois Department of Central Management Services (CMS) Business Enterprise Program as a BEP certified vendor, and Sheltered Workshops must be registered with the State for procurements containing a State Use Program category.

1. Where there is a **joint venture** between a certified and non-certified vendor, the Utilization Plan must include an executed Joint Venture Agreement specifying the terms and conditions of the relationship between the parties and their rights and responsibilities to the prospective contract. The Joint Venture Agreement must clearly evidence that the BEP/VSB certified vendor will be responsible for a defined portion of the work and its responsibilities, risks, profits, contributions of capital, and personnel are proportionate to its ownership/interest percentage, as well as identifying the appropriate and specific NIGP Class and Class Item codes. It must include specific details related to the parties' contributions of capital, personnel, equipment, share of costs, insurance coverage, and other items; the scopes to be performed by BEP/VSB certified vendor(s) under its supervision; and the commitment of management, supervisory personnel, and operative personnel employed by the BEP/VSB certified vendor to be dedicated to the performance of the contract. Established Joint Venture Agreements will **only** be credited toward BEP/VSB goal achievements for specific work performed by the BEP Certified Joint Venture Vendor. **Each party to the Joint Venture Agreement must execute the bid or offer prior to submission of the bid or offer to the Agency/University.**

2. An agreement between a prime Vendor and a BEP/VSB certified vendor in which a BEP/VSB certified vendor promises not to provide subcontracting or pricing quotations to other vendors is prohibited. The Agency/University may request additional information to demonstrate compliance. Vendor agrees to cooperate promptly with the Agency/University in submitting to interviews, allowing entry to business places, providing documentation, and to soliciting the cooperation of a proposed BEP/VSB certified vendor during investigation. Failure to cooperate by a Vendor and/or BEP/VSB certified vendor may render the bidder or offeror non-responsive or not responsible. **A contract will not be awarded to a Vendor unless that Vendor's Utilization Plan is found responsive.**

3. BEP/VSB Certified Vendor Locator References: Firms must be certified with CMS as BEP/VSB certified vendors at the time of bid or qualify for credit toward the goal through participation in the BEP Mentor/Protégé Program. Vendors may consult CMS' BEP Vendor Directory at www.cms.DiversityCompliance.com.

4. Vendor Assurance: Vendor shall not discriminate based on race, color, national origin, sexual orientation or sex in the performance of this contract. Failure by Vendor to carry out these requirements is a material breach of the contract, which may result in the termination of the

contract or such other remedy, as the Agency/University deems appropriate. **This assurance must be included in each subcontract that Vendor signs with a subcontractor or supplier.**

5. Calculating BEP/VSB Certified Vendor Participation: The Utilization Plan and Participation Agreement(s) identify work and/or goods/equipment anticipated to be provided by all BEP/VSB certified vendors and paid for upon satisfactory completion/delivery, based on NIGP Class and Class Item Code(s). **Only the value of payments made for services performed and/or actual supplies/goods/equipment provided by BEP/VSB certified vendors is counted toward the contract goal.** Applicable guidelines for counting payments attributable to contract goals are summarized below.

5.1. The value of performed work and/or goods/equipment provided by the BEP/VSB certified vendor for the resulting contract shall be counted towards the goal. The entire amount of that portion of the contract that is performed by the BEP/VSB certified vendor, including supplies purchased or equipment leased by the BEP/VSB certified vendor shall be counted, except supplies purchased and equipment rented from the Prime Vendor submitting this bid or offer.

5.2. A BEP certified prime Vendor shall count the portion of the total dollar value of the contract equal to the distinct, clearly defined portion of the work of the contract that the BEP/VSB certified prime Vendor self-performs toward the goal. A BEP/VSB certified prime Vendor shall also count the dollar value of work subcontracted to other BEP/VSB certified vendors. **Work performed by non-BEP/VSB certified parties shall not be counted toward the goal, including work that a BEP/VSB certified vendor subcontracts to non-BEP/VSB certified vendors.**

5.3. A Vendor shall count toward the goal 100% of its expenditures for materials and supplies required under the contract and obtained from a BEP/VSB certified vendor manufacturer, regular dealer, or supplier. A Vendor shall also count toward the goal the following expenditures to BEP/VSB certified vendors that are not manufacturers, regular dealers, or suppliers:

5.3.1. The fees or commissions charged for providing a bona fide service, such as professional, technical, consultant or managerial services and assistance in the procurement of essential personnel, facilities, equipment, materials or supplies required for performance of the contract, provided that the fee or commission is determined by the Agency/University to be reasonable and not excessive as compared with fees customarily allowed for similar services.

5.3.2. The fees charged for delivery of materials and supplies required by the contract (but not the cost of the materials and supplies themselves) when the hauler, trucker, or delivery service is not also the manufacturer or a supplier of the materials and supplies being procured, provided that the fee is determined by the Agency/University to be reasonable and not excessive as compared with fees customarily allowed for similar services. The BEP/VSB certified vendor's trucking

firm must actually be responsible for the management and supervision of the entire trucking operation for which it is responsible on the contract; and must itself own and operate at least one fully licensed, insured and operational truck used on the contract.

5.3.3. The fees or commissions charged for providing any bonds or insurance specifically required for the performance of the contract, provided that the fee or commission is determined by the Agency/University to be reasonable and not excessive as compared with fees customarily allowed for similar services.

5.4. BEP/VSB certified vendors who are performing on a contract as second-tier subcontractors (i.e., subcontractors hired by first-tier subcontractors to perform on the contract) may be counted in meeting the established BEP/VSB goal for this contract where the Prime Vendor will provide monthly documentation indicating the utilization of these vendors by reporting the utilization to the BEP at www.cms.DiversityCompliance.com for State Agencies and by contacting the contract administrator for Universities.

5.5. A Vendor shall count towards the goal only expenditures to BEP/VSB firms that perform a **commercially useful function constituting direct participation** in the work of the contract.

5.5.1. A firm is considered to perform a **commercially useful function** when it is responsible for execution of a distinct element of the work of a contract and carries out its responsibilities by actually performing, managing, and supervising the work involved. The BEP/VSB certified vendor must also be responsible, with respect to materials or supplies used on the contract, for negotiating price, determining quality and quantity, ordering the materials or supplies, and installing the materials (where applicable) and paying for the materials or supplies. To determine whether a firm is performing a commercially useful function, the Agency/University shall evaluate the amount of work subcontracted, whether the amount the firm is to be paid under the contract is commensurate with the work it actually performs, the credit claimed for its performance of the work, industry practices, and other relevant factors.

5.5.2. A BEP certified vendor does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction or contract through which funds are passed through to obtain BEP/VSB certified vendor participation. In determining whether a BEP/VSB certified vendor is such an extra participant, the Agency/University shall examine industry practices and similar transactions, particularly those in which BEP/VSB certified vendors actually participate in a meaningful way.

5.6. A Vendor shall not count towards the goal expenditures that are not direct, necessary and related to the work of the contract. Only the amount of services and/or goods

that are directly attributable to the performance of the contract shall be counted. Ineligible expenditures include, but are not limited to, general office overhead and other Vendor support activities, unless allowed by the Agency/University.

6. Good Faith Effort Procedures: Prime Vendors must submit in their bid a Utilization Plan and Participation Agreement(s) that meet or exceed the published goal. If a Prime Vendor cannot meet the stated goal, it must fill out and attach Part III of this document, explaining the Good Faith Efforts it undertook to meet the goal, including contacting all certified BEP/VSB vendors that fall under the scope of work/NIGP Class and Class Item codes identified in the solicitation documentation. Utilization Plans and attached documentation are due at the time of bid or offer submission. The Business Enterprise Council ("Council") or its delegate will consider the quality, quantity, and intensity of the Vendor's efforts to meet the BEP goal. The procuring Agency/University will consider the quality, quantity, and intensity of the Vencor's efforts to meet the VSB goal.

The Utilization Plan contains a checklist of actions that the Council or its delegate will consider as evidence of Vendor's Good Faith Efforts to meet the BEP goal and that the Agency/University will consider as evidence of Vendor's Good Faith Efforts to meet the VSB goal. Documentation that alters or replaces the Utilization Plan and/or Participation Agreement(s), other than supplemental documentation, will not be considered during the Utilization Plan review.

6.1. In evaluating Vendor's Good Faith Efforts, the Council, its delegate, or an Agency/University as applicable may consider whether the ability of other bidders or offerors to meet the contract goal suggests that Good Faith Efforts could have resulted in Vendor meeting the goal.

6.2. If the Council, its delegate, or an Agency/University determines that Vendor has made Good Faith Efforts to meet the BEP and VSB goal, respectively, the Agency/University may award the contract provided that Vendor is otherwise eligible for award.

6.3. If the Council, its delegate, or an Agency/University, as applicable, determines that Good Faith Efforts have not been met, the bid or offer may be determined to be non-responsive by the Chief Procurement Officer.

7. Contract Compliance: Compliance with this section is an essential part of the contract. The following administrative procedures and remedies govern Vendor's compliance with the contractual obligations established by the Utilization Plan and Participation Agreement(s). **After approval of the Utilization Plan and Participation Agreement(s) as well as the award of the contract, the Utilization Plan, including all applicable Parts, becomes part of the contract.** If a Prime Vendor requested a waiver due to its inability to obtain BEP/VSB certified vendor participation equal to or exceeding the goal, and the Utilization Plan was approved and contract awarded based upon a determination of Good Faith Effort, the total dollar value of BEP/VSB certified vendor work in the approved Utilization Plan, calculated as a percentage of the total awarded contract value, shall become the final contract goal.

STATE OF ILLINOIS BUSINESS ENTERPRISE PROGRAM
UTILIZATION PLAN

7.1. The Utilization Plan and Participation Agreement(s) may not be amended after contract execution without Agency/University prior written approval.

7.2. **Vendor may not make modifications to its contractual BEP/VSB certified vendor commitments or substitute BEP/VSB certified vendors without the prior written Agency/University approval**. Unauthorized modifications or substitutions, including performing the work designated for a BEP/VSB certified vendor with Vendor's own forces, shall be a violation of the Utilization Plan and therefore a breach of the contract, cause to terminate the contract, and cause to seek other contract remedies or sanctions. For Agency/University approval of modifications or substitutions, the facts supporting the modifications or substitutions must not have been known nor reasonably should have been known by the parties prior to entering into the contract and/or subcontract. Vendor must negotiate with BEP/VSB certified vendors to resolve problems. Where there has been a mistake or disagreement about the scope of work and/or goods/equipment required by the contract, the BEP/VSB certified vendor can be substituted, but only where agreement cannot be reached for a reasonable price or schedule for the correct scope of work, goods and/or equipment. Any subsequent change **must** be submitted to the soliciting Agency/University and BEP Secretary, in writing, and approved by the soliciting Agency/University.

7.3. Substitutions of a BEP/VSB certified vendor may be permitted under the following circumstances:

7.3.1. Unavailability after receipt of reasonable notice to proceed;

7.3.2. Failure of performance;

7.3.3. Financial incapacity;

7.3.4. Refusal by the BEP/VSB certified vendor to honor the bid or proposal price or scope;

7.3.5. Material mistake of fact or law about the elements of the scope of work of a contract where a reasonable price cannot be agreed upon;

7.3.6. Failure of the BEP/VSB certified vendor to meet insurance, licensing or bonding requirements;

7.3.7. The BEP/VSB certified vendor's withdrawal of its bid or offer; and/or

7.3.8. Failure of the BEP/VSB certified vendor to maintain certification.

7.4. If it becomes necessary to substitute a BEP/VSB certified vendor, the prime Vendor must notify the Agency/University and BEP Secretary, in writing, of the request to substitute a BEP/VSB certified vendor or otherwise modify the Utilization Plan and

Participation Agreement(s). The request must state specific reasons for the substitution or modification. The Agency/University shall notify the Council or its delegate of the request to substitute a BEP/VSB certified vendor or change the Utilization Plan and Participation Agreement(s). The Agency/University will approve or deny a request for substitution or other change in the Utilization Plan and/or Participation Agreement(s) within five business days of receipt of the request or may request a BEP review of the documentation.

7.5. Where Vendor has established the basis for the substitution to the satisfaction of the Agency/University, it must make Good Faith Efforts to meet the contract goal by substituting one or more BEP/VSB certified vendors. Documentation of a replacement BEP certified vendor, or of Good Faith Efforts to replace the BEP/VSB certified vendor, must meet the requirements of the initial Utilization Plan. If the goal cannot be reached and Good Faith Efforts have been made, Vendor may substitute with a non-BEP/VSB certified vendor.

7.6. Prime Vendors are encouraged to utilize BEP/VSB certified firms. If a Vendor plans to hire a subcontractor for any scope of work that was not previously disclosed in the Utilization Plan and this increases BEP/VSB participation, Vendor must obtain the approval of the Agency/University to modify the Utilization Plan and must make Good Faith Efforts to ensure that BEP/VSB certified vendors have a fair opportunity to submit a bid or offer on the new scope of work.

7.7. If the Prime Vendor wishes to substitute its BEP/VSB certified subcontractor, a BEP/VSB certified vendor Utilization Plan and Participation Agreement must be executed and submitted to the Agency/University within five (5) business days of Vendor's receipt of the Agency/University approval for the substitution. The Agency/University must supply the new BEP Utilization Plan and Participation Agreement(s) to the BEP Secretary or their designee.

7.8. Vendor shall maintain a record of all relevant data with respect to the utilization of BEP/VSB certified vendors including, but not limited to, payroll records, invoices, canceled checks and books of account for a period of at least three (3) years after the completion of the contract. If the contract administrator is an Agency, Vendor shall submit monthly reports to BEP via the B2G Now Diversity Contract Monitoring System (DCMS) reporting system**. If the contract administrator is a University, Vendor shall contact the contract administrator to obtain reporting requirements.** Full access to these records shall be granted by Vendor within 48 hours of a written demand by the Agency/University, BEP Secretary, or any duly authorized representative thereof, or to any municipal, county, State or federal authorities. The Agency/University shall have the right to obtain from Vendor any additional data reasonably related or necessary to verify any representations by Vendor. After the performance of the final item of work or delivery of material by the BEP certified vendor and final payment to the BEP certified vendor by Vendor, but not later than thirty (30) calendar days after such payment, Vendor shall submit a statement confirming the final payment and the total payments

made to the BEP certified vendor under the contract at www.cms.DiversityCompliance.com for contracts administrated by Agencies. For contracts administered by Universities, Vendor shall submit a statement confirming the final payment and the total payments made to the BEP/VSB certified vendor under the contract in the manner prescribed by the University contract administrator. **Vendor's failure to submit monthly reports shall constitute a material breach of this contract and subject Vendor to the remedies and penalties described in Section 7.10. For contracts administrated by Agencies, The Prime Vendor and BEP subcontractors will receive notification and instructions after the start of the contract for reporting to BEP's DCMS. Failure to report contractual spend or lack of spend monthly reporting may result in a contractual breach.**

7.9. The Agency/University will annually review Vendor's compliance with these provisions and the terms of its contract. Executive Order Number 2018-06 requires CMS to review contractual language regarding cancelation of contracts deemed not to be compliant with the BEP. Without limitation, Vendor's failure to comply with these provisions or its contractual commitments as contained in the Utilization Plan and Participation Agreement(s); failure to cooperate in providing information regarding its compliance with these provisions or its Utilization Plan; or provision of false or misleading information or statements concerning compliance, certification status or eligibility of a BEP certified vendor, Good Faith Efforts or any other material fact or representation shall constitute a material breach of this contract and entitle the Agency/University to declare a default, terminate the contract, and/or exercise those remedies provided for in the contract, law and equity.

7.10. The Agency/University reserves the right to withhold payment to Vendor to enforce these provisions and Vendor's contractual commitments. Final payment shall not be made pursuant to the contract until Vendor submits sufficient documentation demonstrating compliance with its Utilization Plan and Participation Agreement(s).

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Illinois Works Apprenticeship Initiative
Periodic Grantee Report

Organization Name		FEIN Number		DUNS Number	
Grant Awarding Agency		Project Start Date		Project End Date	
Grant Number		Estimated Total Project Costs		Estimated Total State Contribution	

Reporting Period: Period Start Date _____ Period End Date _____

Applicable Apprenticeship Goal (Select all that apply):

☐ 10% total project cost ☐ 10% total state contribution only

☐ Waiver Approved by IL DCEO IL DCEO Waiver Approval Date _____

(If a waiver was granted for any prevailing wage classification, the Grantee does not need to report on those classifications on this form.)

☐ Reduction Approved by IL DCEO IL DCEO Reduction Approval Date _____

(If selected, enter the applicable prevailing wage classification(s) and approved reduced percentage(s).)

Prevailing Wage Classification	Reduced Percentage		Prevailing Wage Classification	Reduced Percentage

Prevailing Wage Classification	Reduced Percentage		Prevailing Wage Classification	Reduced Percentage

Illinois Works Apprenticeship Initiative
Periodic Grantee Report

Please provide information in this chart for the entire project if the apprenticeship goal applies to the entire project.

Provide information for only the state contribution if the apprenticeship goal applies only to state appropriated capital funds.

Prevailing Wage Classification	Total Hours for Classification in Reporting Period	Total Apprentice-ship Hours for Classification in Reporting Period	% of Apprentice-ship Hours	Total Hours for Classification (Cumulative from Start of the Project)	Total Apprentice-ship Hours (Cumulative from Start of the Project)	% of Apprentice-ship Hours (Cumulative from Start of the Project)	If no apprenticeship hours recorded, explain.

Prevailing Wage Classification	Total Hours for Classification in Reporting Period	Total Apprentice-ship Hours for Classification in Reporting Period	% of Apprentice-ship Hours	Total Hours for Classification (Cumulative from Start of the Project)	Total Apprentice-ship Hours (Cumulative from Start of the Project)	% of Apprentice-ship Hours (Cumulative from Start of the Project)	If no apprenticeship hours recorded, explain.

Organization Certification and State Agency Acknowledgement

1. Organization Certification:

By signing this form, I certify to the best of my knowledge and belief that the form is true, complete and accurate and that any false, fictitious or fraudulent information or the omission of any material fact could result in the immediate termination of my grant award(s).

Institution/Organization Name:

Printed Name (Executive Director or equivalent):

Title (Executive Director or equivalent):

Signature (Executive Director or equivalent):

Date/Time Field

2. State Agency Acknowledgement:

State Agency

Printed Name

Title

Signature:

Date/Time Field

PROJECT LABOR AGREEMENT

As adopted on November 10, 2004 by the
Southwestern Illinois Building & Construction Trades Council Board of Business Agents

This Agreement is entered into this _____ day of _____, 2023 by and between_____ and the Southwestern Illinois Building Trades Council (SIBTC) for and on behalf of its affiliates which sign a “Union Letter of Assent” (Signatory Union Affiliates) for this Project Labor Agreement, hereinafter referred to as the "Union”. This Agreement shall apply to work performed by the Employer and its Contractors and Subcontractors on Construction known as the: _____

_____.

ARTICLE I - INTENT AND PURPOSES

1.1 This Project Agreement shall apply and is limited to the recognized and accepted historical definition of new construction work under the direction of and performed by the Contractor(s), of whatever tier, which may include the Project Contractor, who have contracts awarded for such work on the Project. Such work shall include site preparation work and dedicated off-site work.

The Project is defined as:

_____ .

1.2 It is agreed that the Project Contractor shall require all Contractors of whatever tier who have been awarded contracts for work covered by this Agreement, to accept and be bound by the terms and conditions of this Project Agreement by executing the Letter of Assent (Attachment A) prior to commencing work. The Project Contractor shall assure compliance with this Agreement by the Contractors. It is further agreed that the terms and conditions of this Project Agreement shall supersede and override terms and conditions of any and all other national, area, or local collective bargaining agreements, (including all vertical agreements), except for all work performed under the NTL Articles of Agreement, the National Stack/Chimney Agreement, the National Cooling Tower Agreement, and the National Agreement of the International Union of Elevator Constructors.

1.3 The Contractor agrees to be bound by the terms of the Collective Bargaining Agreements and amendments thereto of the Signatory Union Affiliates and the applicable employers association, if any, with the Signatory Union Affiliates with which it has a present bargaining relationship. If there has previously been no such bargaining relationship, the contractor or subcontractor shall sign and be bound to all such agreements with Signatory Union Affiliates as outlined in the scope of work in the required pre-job conference. Such agreements are incorporated herein by reference. In order to comply with the requirements of the various fringe benefit funds to which the Contractor is to contribute, the Contractor shall sign such participation agreements as are necessary and will honor the fringe benefit collection procedures as required by the Collective Bargaining Agreement with the Signatory Union Affiliate.

1.4 The Contractor and the Union agree that should the Collective Bargaining Agreement (CBA) of any Signatory Union Affiliate expire prior to the completion of this project, the expired contracts' terms will be maintained until a new CBA is ratified. The wages, and fringe benefits included in any new CBA will be effective on the effective date of the newly negotiated CBA unless wage and fringe benefit retroactivity is agreed upon by the bargaining parties.

1.5 Nothing contained herein shall be construed to prohibit, restrict or interfere with the performance of any other operation work, or function which may occur at the Project site or be associated with the development of the Project.

1.6 This Agreement shall only be binding on the signatory parties hereto and shall not apply to their parents, affiliates, subsidiaries, or Non-Signatory Union Affiliates.

1.7 The Owner and/or the Project Contractor have the absolute right to select any qualified bidder for the award of contracts on this Project without reference to the existence or nonexistence of any agreements between such bidder and any party to this Agreement; provided, however, only that such bidder is willing, ready and able to become a party to and comply with this Project Agreement, should it be designated the successful bidder.

1.8 Items specifically excluded from the scope of this Agreement include but are not limited to the following: [list all items to be excluded].

1.9 The provisions of this Project Agreement shall not apply to (Owner), and nothing contained herein shall be construed to prohibit or restrict (Owner) or its employees from performing work not covered by this Project Agreement on the Project site. As areas and systems of the Project are inspected and construction tested by the Project Contractor or Contractors and accepted by the Owner, the Project Agreement will not have further force or effect on such items or areas, except when the Project Contractor or Contractors are directed by the Owner to engage in repairs, modifications, check-out, and warranty functions required by its contract with the Owner during the term of this Agreement.

1.10 It is understood that the Owner, at its sole option, may terminate, delay and/or suspend any or all portions of the Project at any time.

1.11 It is understood that the liability of any employer and the liability of a Signatory Union Affiliate and the SIBTC under this Agreement shall be several and not joint. Provided that the SIBTC or a Signatory Union Affiliate comply with their own obligations under this Agreement, the SIBTC and non-breaching Signatory Union Affiliates will not be liable for a breach of this Agreement by a breaching Signatory Union Affiliate or any action taken by a Non-Signatory Union Affiliate. The Union agrees that this Agreement does not have the effect of creating any joint employer status between or among the Owner, Contractor(s) or any employer.

1.12 Each affiliate union of the SIBTC representing employees engaged in construction work covered by this Agreement shall be requested to sign the "Union Letter of Assent", in the form attached hereto; provided, that the failure of any affiliate union to sign such Union Letter of Assent prior to commencement of construction work shall not diminish the applicability of this Agreement to the SIBTC and the union affiliates which have signed a Union Letter of Assent. Affiliates unions that have signed the Union Letter of Assent will be referred to as "Signatory Union Affiliates" and affiliate unions that have not signed the Union Letter of Assent will be referred to as "Non-Signatory Union Affiliates".

ARTICLE II - RECOGNITION

2.1 The Contractor recognizes the SIBTC and the Signatory Union Affiliates as the sole and exclusive bargaining representatives for its craft employees employed on the job site. Signatory Union Affiliates will have recognition on the project for their craft.

ARTICLE III - ADMINISTRATION OF AGREEMENT

3.1 In order to assure that all parties have a clear understanding of the Agreement, to promote harmony and address potential problems, a pre-job conference will be held with the Contractor, SIBTC Representatives and all signatory parties prior to the start of any work on the project.

3.2 Representatives of the Contractor and the Union shall meet as required but not less than once a month to review the operation of this Agreement. The representatives at this meeting shall be empowered to resolve any dispute over the intent and application of the Agreement.

3.3 The Contractor shall make available in writing to the Union no less than one week prior to these meetings a job status report, planned activities for the next 30 day period, actual numbers of craft employees on the project and estimated numbers of employees by craft required for the next 30 day period. The purpose of this report is to allow time to address any potential jurisdictional problems and to ensure that no party signatory to the Agreement is hindering the continuous progress of the project through a lack of planning or shortage of manpower.

ARTICLE IV - HOURS OF WORK OVERTIME SHIFTS & HOLIDAYS

4.1 The standard work day shall be an established consecutive eight (8) hour period between the hours of 7:00 a.m. and 5:00 p.m. with one-half hour designated as unpaid period for lunch. The standard work week shall be five (5) consecutive days of work commencing on Monday. Starting time which is to be established at the pre-job conference will be applicable to all craft employees on the project. Should job conditions dictate a change in the established starting time and/or a staggered lunch period on certain work of the project or with individual crafts, the Contractor, Business Managers of the Signatory Union Affiliates involved and the SIBTC shall mutually agree to such changes. If work schedule change cannot be mutually agreed to between these parties, the hours fixed in the Agreement shall prevail.

4.2 All time before and after the established work day of eight (8) hours, Monday through Friday and all time on Saturday shall be paid in accordance with each crafts current collective bargaining agreement. All time on Sundays and Holidays shall be paid for at the rate of double time.

(a) Fringe benefit payments for all overtime work shall be paid in accordance with each Signatory Union Affiliate=s current Collective Bargaining Agreement.

4.3 Shift work, if used, shall be as provided in the collective bargaining agreement of each affected Signatory Union Affiliate.

4.4 Recognized Holidays shall be as follows: New Year's Day, Memorial Day, Fourth of July, Labor Day, Veterans Day ***(to be celebrated on November 11),*** Thanksgiving Day and Christmas Day. No work will be performed on Labor Day under any consideration, except in an extreme emergency and then only after consent is given by the Business Manager of the Signatory Union Affiliates.

ARTICLE V - ABSENTEEISM

5.1 The Contractor and the Union agree that chronic and/or unexcused absenteeism is undesirable and must be controlled. Employees that develop a record of such absenteeism shall be identified by the Contractor to the appropriate referral facility and the Contractor shall support such action with the work record of the involved employee. Any employee terminated for such absenteeism shall not be eligible for rehire on the project for a period of no less than ninety (90) days.

ARTICLE VI-MANAGEMENT RIGHTS

6.1 The Contractor retains and shall exercise full and exclusive authority and responsibility for the management of its operations, except as expressly limited by the terms of this Agreement and the collective bargaining agreements of the Signatory Union Affiliates.

ARTICLE VII - GENERAL WORKING CONDITIONS

7.1 Employment begins and ends at the project site, to be determined at the Pre-Job Conference.

7.2 Employees shall be at their place of work at the starting time and shall remain at their place of work until quitting time. The parties reaffirm their policy of a fair day=s work for a fair day=s pay.

7.3 The Contractor may utilize brassing, or other systems to check employees in and out. Should such procedures be required, the techniques and rules regarding such procedures shall be established by mutual consent of the parties at the pre-job conference.

7.4 There shall be no limit on production by workmen nor restrictions on the full use of tools or equipment. Craftsmen using tools shall perform any work of their trade and shall work under the direction of the craft foreman. There shall be no restrictions on efficient use of manpower other than as may be required by safety regulations.

7.5 Crew Foreman shall be utilized as per the existing collective bargaining agreements. The Contractor agrees to allow crew foremen ample time to direct and supervise their crew. The Union agrees there will be no restrictions placed on crew foreman's ability to handle tools and materials.

7.6 The Contractor may utilize the most efficient methods or techniques of construction, tools or other labor saving devices to accomplish the work. Practices not a part of the terms and conditions of this Agreement will not be recognized.

7.7 Should overtime work be required, the Contractor will have the right to assign specific employees and/or crews to perform such overtime work as is necessary to accomplish the work.

7.8 The Contractor may establish such reasonable project rules as the Contractor deems appropriate. These rules will be reviewed and established at the pre-job conference and posted at the project site by the Contractor.

7.9 It is recognized that specialized or unusual equipment may be installed on the project and in such cases, the Union recognizes the right of the Contractor to involve the equipment supplier or vendor's personnel in supervising the setting of the equipment, making modifications and final alignment which may be necessary prior to and during the start-up procedure, in order to protect factory warranties.

7.10 In order to promote a harmonious relationship between the equipment or vendor's personnel and the Building Trades craftsmen, a meeting shall be held between the Contractor and the Unions prior to any involvement on the project by these personnel. The Contractor will inform the Union of the nature of involvement by these personnel and the numbers of personnel to be involved, allowing ample time for the Union representatives to inform their stewards prior to the start of any work.

ARTICLE VIII - SAFETY

8.1 The employees covered the terms of this Agreement shall at all times while in the employ of the Contractor be bound by the safety rules and regulations as established by the Contractor in accordance with the Construction Safety Act and OSHA.

a. These rules and regulations will be published and posted at conspicuous places throughout the project.

8.2 In accordance with the requirements of OSHA, it shall be the exclusive responsibility of each Contractor on a jobsite to which this Agreement applies, to assure safe working conditions for its employees and compliance by them with any safety rules contained herein or established by the Contractor. Nothing in this Agreement will make the SIBTC or any of its affiliates liable to any employees or to other persons in the event that injury or accident occurs.

ARTICLE IX - SUBCONTRACTING

9.1 The Project Contractor agrees that neither it nor any of its contractors or subcontractors will subcontract any work to be done on the Project except to a person, firm or corporation who is or agrees to become party to this Agreement. Any contractor or subcontractor working on the Project shall, as a condition to working on said Project, become signatory to and perform all work under the terms of this Agreement.

ARTICLE X - UNION REPRESENTATION

10.1 Authorized representatives of the SIBTC and its Signatory Union Affiliates shall have access to the project provided they do not interfere with the work of the employees and further provided that such representatives fully comply with the visitor and security rules established for the project.

10.2 Each Signatory Union Affiliate shall have the right to designate a working journeyman as a steward. Such designated steward shall be a qualified worker performing the work of that craft and shall not exercise any supervisory functions. Each steward shall be concerned with the employees of the steward's employer and not with the employees of any other employer.

10.3 The working steward will be paid at the applicable wage rate for the job classification in which he is employed.

10.4 The working steward shall not be discriminated against because of his activities in performing his duties as steward, and except as otherwise provided in local agreements, shall be the last employee in his craft to be laid off in any reduction in force. Stewards will be subject to discharge to the same extent that other employees are only after notification to the Union Representative. The Contractor will permit stewards sufficient time to perform the duties inherent to a steward's responsibilities. Stewards will be offered available overtime work if qualified.

ARTICLE XI - DISPUTES AND GRIEVANCES

11.1 This Agreement is intended to provide close cooperation between management and labor. Each of the Signatory Union Affiliates will assign a representative to this Project for the purpose of completing the construction of the Project economically, efficiently, continuously, and without interruptions, delays, or work stoppages.

11.2 The Contractors, Union, and the employees, collectively and individually, realize the importance to all parties to maintain continuous and uninterrupted performance of the work of the Project, and agree to resolve disputes in accordance with the grievance arbitration provisions set forth in this Article.

11.3 Any question or dispute arising out of and during the term of this Project Agreement (other than trade jurisdictional disputes) shall be considered a grievance and subject to resolution under the following procedures:

Step 1. (a) When any employee subject to the provisions of this Agreement feels he or she is aggrieved by a violation of this Agreement, he or she, through his or her local union business representative or job steward, shall, within five (5) working days after the occurrence of the violation, give notice to the work-site representative of the involved Contractor stating the provision(s) alleged to have been violated. The business representative of the local union or the job steward and the work-site representative of the involved Contractor and the Project Contractor shall meet and endeavor to adjust the matter within three (3) working days after timely notice has been given. The representative of the Contractor shall keep the meeting minutes and shall respond to the Union representative in writing (copying the Project Contractor) at the conclusion of the meeting but not later than twenty-four (24) hours thereafter. If they fail to resolve the matter within the prescribed period, the grieving party may, within forty-eight (48) hours thereafter, pursue Step 2 of the Grievance Procedure, provided the grievance is reduced to writing, setting forth the relevant information concerning the alleged grievance, including a short description

thereof, the date on which the grievance occurred, and the provision(s) of the Agreement alleged to have been violated.

(b) Should the Local Union(s) or the Project Contractor or any Contractor have a dispute with the other party and, if after conferring, a settlement is not reached within three (3) working days, the dispute may be reduced to writing and proceed to Step 2 in the same manner as outlined herein for the adjustment of an employee complaint.

Step 2. The International Union Representative and the involved Contractor shall meet within seven (7) working days of the referral of a dispute to this second step to arrive at a satisfactory settlement thereof. Meeting minutes shall be kept by the Contractor. If the parties fail to reach an agreement, the dispute may be appealed in writing in accordance with the provisions of Step 3 within seven (7) calendar days thereafter.

Step 3. (a) If the grievance has been submitted but not adjusted under Step 2, either party may request in writing, within seven (7) calendar days thereafter, that the grievance be submitted to an Arbitrator mutually agreed upon by them. The Contractor and the involved Union shall attempt mutually to select an arbitrator, but if they are unable to do so, they shall request the American Arbitration Association to provide them with a list of arbitrators from which the Arbitrator shall be selected. The rules of the American Arbitration Association shall govern the conduct of the arbitration hearing. The decision of the Arbitrator shall be formal and binding on all parties. The fee and expenses of such Arbitration shall be borne equally by the Contractor and the involved Local Union(s).

(b) Failure of the grieving party to adhere to the time limits established herein shall render the grievance null and void. The time limits established herein may be extended only by written consent of the parties involved at the particular step where the extension is agreed upon. The Arbitrator shall have the authority to make decisions only on issues presented to him or her, and he or she shall not have authority to change, amend, add to or detract from any of the provisions of this Agreement.

11.4 The Project Contractor and Owner shall be notified of all action at Steps 2 and 3 and shall, upon their request, be permitted to participate in all proceedings at these steps.

ARTICLE XII - JURISDICTIONAL DISPUTES

12.1 The assignment of work will be solely the responsibility of the Contractor performing the work involved, in accordance with applicable Collective Bargaining Agreements and past practices. To the extent that past practice is a factor in assigning work under the Project Labor Agreement, including assignments under any collective bargaining agreements to which any of the signatory contractors hereto may be a party, the practice to be applied shall be that followed within the geographical area encompassed by the Southwestern Illinois Building and Construction Trades Council. The practice followed in any other geographical area, even though a Union signatory to this Project Labor Agreement may also represent employees in that area, shall not be a factor in the assignment. All jurisdictional disputes between or among Building and Construction Trades Unions and employees and the Contractor, parties to this Agreement, shall be settled and adjusted according to the present Plan established by the Building and Construction Trades Department or any other plan or method of procedure that may be adopted in the future by the Building and Construction Trades Department. Decisions rendered shall be final, binding and conclusive on the Contractor and Union parties to this Agreement.

12.2 All jurisdictional disputes shall be resolved without the occurrence of any strike, work stoppage, or slow-down of any nature, and the Contractor's assignment shall be adhered to until the dispute is resolved. Individuals violating this section shall be subject to immediate discharge.

12.3 Each Contractor will conduct a pre-job conference with the appropriate Building and Construction Trades Council prior to commencing work. The Project Contractor and the Owner will be advised in advance of all such conferences and may participate if they wish.

ARTICLE XIII - WORK STOPPAGES AND LOCKOUTS

13.1 During the term of this Agreement there shall be no strikes, picketing, work stoppages, slow downs or other disruptive activity for any reason by the SIBTC, its Signatory Union Affiliates or by any employee and there shall be no lockout by the Contractor. Failure of any Signatory Union Affiliate or employee to cross any picket line established at the project site is a violation of this Article.

13.2 The SIBTC and its Signatory Union Affiliates shall not sanction, aid or abet, encourage or continue any work stoppage, picketing or other disruptive activity and will not make any attempt of any kind to dissuade others from making deliveries to or performing services for or otherwise doing business with the Contractor at the project site. Should any of these prohibited activities occur the SIBTC and the Signatory Union Affiliates will take the necessary action to end such prohibited activities.

13.3 No employee shall engage in any activities which violate this Article. Any employee who participates in or encourages any activities which interfere with the normal operation of the project shall be subject to disciplinary action, including discharge, and if justifiably discharged for the above reasons, shall not be eligible for rehire on the same project for a period of not less than ninety (90) days.

13.4 Neither the SIBTC nor its Signatory Union Affiliates, will be liable for acts of employees for whom it has no responsibility. The principal officer or officers of the SIBTC will immediately instruct, order and use the best efforts of his office to cause Signatory Union Affiliates to cease any violations of this Article. The SIBTC in its compliance with this obligation shall not be liable for unauthorized acts of Signatory Union Affiliates or Non-Signatory Union Affiliates. The principal officer or officers of any involved Signatory Union Affiliate will immediately instruct, order or use the best effort of his office to cause the employees the union represents to cease any violations of this Article. A union complying with this obligation shall not be liable for unauthorized acts of employees it represents. The failure of the Contractor to exercise its right in any instance shall not be deemed a waiver of its right in any other instance.

13.5 In lieu of any action at law or equity, any party shall institute the following procedure when a breach of this Article is alleged, after all involved parties have been notified of the fact.

a. The party invoking this procedure shall notify _____ whom the parties agree shall be the permanent arbitrator under this procedure. In the event the permanent arbitrator is unavailable at any time, he shall appoint his alternate. Notice to the arbitrator shall be by the most expeditious means available, with notice by telegram or any effective written means to the party alleged to be in violation and all involved parties.

b. Upon receipt of said notice the arbitrator named above shall set and hold a hearing within twenty-four (24) hours if it is contended the violation still exists but not before twenty-four (24) hours after the telegraph notice to all parties involved as required above.

c. The Arbitrator shall notify the parties by telegram or any other effective written means, of the place and time he has chosen for this hearing. Said hearing shall be completed in one session. A failure of any party or parties to attend said hearing shall not delay the hearing of evidence or issuance of an Award by the Arbitrator.

d. The sole issue at the hearing shall be whether or not a violation of this Article has in fact occurred. The Award shall be issued in writing within three (3) hours after the close of the hearing, and may be issued without an Opinion. If any party desires an Opinion, one shall be issued within fifteen (15) days, but its issuance shall not delay compliance with, or enforcement of, the Award. The Arbitrator may order cessation of the violation of this Article, and such Award shall be served on all parties by hand or registered mail upon issuance.

e. Such Award may be enforced by any court of competent jurisdiction upon the filing of the Agreement and all other relevant documents referred to herein above in the following manner. Telegraphic notice of the filing of such enforcement proceedings shall be given to the other party. In the proceeding to obtain a temporary order enforcing the Arbitrator's Award as issued under Section 13.5 of this Article, all parties waive the right to a hearing and agree that such proceedings may be exparte. Such agreement does not waive any party's right to participate in a hearing for a final order of enforcement. The Court's order or orders enforcing the Arbitrator's Award shall be served on all parties by hand or by delivery to their last known address or by registered mail.

f. Any rights created by statue or law governing arbitration proceedings inconsistent with the above procedure or which interfere with compliance therewith are hereby waived by parties to whom they accrue.

g. The fees and expenses of the Arbitrator shall be borne by the party or parties found in violation, or in the event no violation is found, such fees and expenses shall be borne by the moving party.

h. If the Arbitrator determines in accordance with Section 13.5 that the SIBTC or a Signatory Union Affiliate has violated Article XIII, the SIBTC or the Signatory Union Affiliate shall, within eight (8) hours of receipt of this Award, direct all employees they represent at the project to immediately return to work. If the employees do not return to work at the beginning of the next regularly scheduled shift following receipt of the Arbitrator=s Award, and the SIBTC or Signatory Union Affiliate have not complied with Section 13.4 above, then the SIBTC or the Signatory Union Affiliate which has not complied with Section 13.4 shall pay the sum of ten thousand dollars ($10,000) as liquidated damages to the affected owner, and shall pay an additional ten thousand dollars ($10,000) per shift for each shift thereafter on which the employees have not returned to work. The Arbitrator shall retain jurisdiction to determine compliance with this Section and Section 13.4, and to assess liquidated damages.

ARTICLE XIV - GENERAL SAVINGS CLAUSE

14.1 If any Article or provision of this Agreement shall be declared invalid, inoperative or unenforceable by operation of law or by any of the above mentioned tribunals of competent jurisdiction, the remainder of this Agreement or the application of such Article or provision to persons or circumstances other than those as to which it has been held invalid, inoperative or unenforceable shall not be affected thereby.

ARTICLE XV - TERM OF AGREEMENT

15.1 This Agreement shall be in full force as of and from the date of the Notice of Award to the Final Acceptance of all applicable contractors.

IN WITNESS WHEREOF, the respective duly authorized representatives of the parties hereto have executed this Agreement on the date set forth opposite their respective signatures.

Date: _____

_____
(Contractor Representative)

_____
(Firm's Name)

_____
(Firm's Address)

_____

_____
(Phone Number)

_____
Email address

Date: _____

_____
Eric Oller, Exec. Sec.-Treas.
Southwestern Illinois Building &
Construction Trades Council
2A Meadow Heights Professional Park
Collinsville, IL 62234

ATTACHMENT A (CONTRACTOR LETTER OF ASSENT)

Note: All contractors of whatever tier (except those construction contractors who have directly signed the Agreement) shall execute the following Letter of Assent prior to commencing work:

CONTRACTOR LETTERHEAD

DATE

To: (Name of Owner)
(Address of Owner)

RE: _____ Construction Project Agreement

Dear Sir:

Pursuant to Article I, Section 1.2, of the above reference Agreement, the undersigned contractor hereby agrees that it will be bound by and comply with all terms and conditions of said Project Labor Agreement, and any amendments thereto.

This Letter of Assent will remain in effect for the duration of the Agreement, and any extensions, after which this understanding will automatically terminate, except as provided for in Article I, Section 1.9, of the Agreement.

Sincerely,

_____
(Company Name)

By:_____
(Authorized Representative)

Title:_____

Date: _____

Phone: _____

INSTRUCTION TO BIDDERS

Award of Contract

The general contract will be awarded to the lowest responsible and eligible general bidder complying with the conditions and requirements provided in these instructions, the bid forms and the other bid documents. A “responsible” bidder is a bidder demonstrably possessing the skill, ability and integrity necessary to faithfully perform the work called for by the contract, based upon a determination of competent workmanship and financial soundness. An “eligible” bidder is a bidder who is not debarred from bidding under any applicable law, and who shall certify that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the project. In the interests of such harmony, the long-term supply of skilled manpower, and to provide a legally enforceable means of assuring labor stability and labor peace over the life of the project, each successful bidder and any and all levels of subcontractors, as a condition of being awarded a contract or subcontract, shall be required to enter into a Project Labor Agreement for the project known as:_____ _____ located in the (Municipality) with the Southwestern Illinois Building and Construction Trades Council, AFL-CIO, and its Signatory Affiliated Local Unions for the development and construction of the Project, and will be bound by the provisions of that agreement in the same manner as any other provision of the contract.

St. Clair County Prevailing Wage Rates posted on 8/15/2023

						Overtime										
Trade Title	**Rg**	**Type**	**C**	**Base**	**Foreman**	**M-F**	**Sa**	**Su**	**Hol**	**H/W**	**Pension**	**Vac**	**Trng**	**Other Ins**	**Add OT 1.5x owed**	**Add OT 2.0x owed**
ASBESTOS ABT-GEN	All	BLD		34.78	35.78	1.5	1.5	2.0	2.0	8.70	18.90	0.00	0.80		13.80	27.60
ASBESTOS ABT-MEC	All	BLD		34.30	35.30	1.5	1.5	2.0	2.0	10.20	6.80	0.00	0.50	0.00	0.00	0.00
BOILERMAKER	All	BLD		41.50	45.00	1.5	1.5	2.0	2.0	7.07	26.56	0.00	1.06		0.00	0.00
BRICK MASON	All	BLD		36.74	38.94	1.5	1.5	2.0	2.0	9.05	15.68	0.00	0.91	0.00	0.00	0.00
CARPENTER	All	ALL		43.52	46.02	1.5	1.5	2.0	2.0	10.00	10.55	0.00	0.70	0.00	0.00	0.00
CEMENT MASON	All	ALL		38.00	39.00	1.5	1.5	2.0	2.0	11.00	16.80	0.00	0.50	0.00	14.15	28.30
CERAMIC TILE FINISHER	All	BLD		28.08		1.5	1.5	2.0	2.0	9.05	7.69	1.00	0.85	0.00	0.00	0.00
ELECTRIC PWR EQMT OP	All	ALL		52.84	63.69	1.5	1.5	2.0	2.0	6.95	14.79	0.00	0.53		11.14	22.27
ELECTRIC PWR GRNDMAN	All	ALL		39.45	63.69	1.5	1.5	2.0	2.0	5.19	11.04	0.00	0.39		8.33	16.62
ELECTRIC PWR LINEMAN	All	ALL		60.74	63.69	1.5	1.5	2.0	2.0	7.99	17.02	0.00	0.61		12.81	25.62
ELECTRIC PWR TRK DRV	All	ALL		43.13	63.69	1.5	1.5	2.0	2.0	5.67	12.08	0.00	0.43		9.10	18.18
ELECTRICIAN	All	ALL		45.49	48.22	1.5	1.5	2.0	2.0	7.99	13.91	0.00	1.25	2.97	13.08	26.12
ELECTRONIC SYSTEM TECH	All	BLD		37.32	40.32	1.5	1.5	2.0	2.0	4.00	11.13	0.00	0.40	1.00	0.56	1.12
ELEVATOR CONSTRUCTOR	All	BLD		57.69	64.90	2.0	2.0	2.0	2.0	16.07	20.56	4.61	0.70		0.00	0.00
FLOOR LAYER	All	BLD		38.73	40.23	1.5	1.5	2.0	2.0	10.00	10.55	0.00	0.70	0.00	0.00	0.00
GLAZIER	All	BLD		41.25	43.75	1.5	1.5	2.0	2.0	9.76	14.23	0.00	1.26	0.00	0.00	0.00
HEAT/FROST INSULATOR	All	BLD		41.73	42.73	1.5	1.5	2.0	2.0	11.74	13.50	0.00	1.05		0.00	0.00
IRON WORKER	All	ALL		38.80	40.80	1.5	1.5	2.0	2.0	10.55	18.50	0.00	0.48		14.77	29.53
LABORER	N	ALL		34.28	35.28	1.5	1.5	2.0	2.0	8.70	18.90	0.00	0.80		13.80	27.60
LABORER	S	ALL		32.89	33.89	1.5	1.5	2.0	2.0	8.03	20.96	0.00	0.80		14.50	28.99
MACHINIST	All	BLD		55.74	59.74	1.5	1.5	2.0	2.0	9.93	8.95	1.85	1.47		0.00	0.00
MARBLE FINISHER	All	BLD		28.08		1.5	1.5	2.0	2.0	9.05	7.69	1.00	0.85	0.00	0.00	0.00
MARBLE MASON	All	BLD		33.62		1.5	1.5	2.0	2.0	9.05	9.25	1.00	0.94	0.00	0.00	0.00
MILLWRIGHT	All	ALL		43.52	46.02	1.5	1.5	2.0	2.0	10.00	10.55	0.00	0.70		0.00	0.00
OPERATING ENGINEER	All	BLD	1	43.95	46.95	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	BLD	2	42.82	46.95	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	BLD	3	38.34	46.95	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85

St. Clair County Prevailing Wage Rates posted on 8/15/2023

OPERATING ENGINEER	All	BLD	4	44.95	46.95	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	BLD	5	45.95	46.95	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	BLD	6	46.50	46.95	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	BLD	7	46.80	46.95	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	BLD	8	47.10	46.95	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	BLD	9	47.75	46.95	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	BLD	10	48.25	46.95	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	BLD	11	45.95	46.95	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	BLD	12	46.95	46.95	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	BLD	13	43.95	46.95	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	BLD	14	38.40	46.95	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	HWY	1	42.45	45.45	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	HWY	2	41.32	45.45	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	HWY	3	36.84	45.45	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	HWY	4	43.45	45.45	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	HWY	5	44.45	45.45	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	HWY	6	45.00	45.45	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	HWY	7	45.30	45.45	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	HWY	8	45.60	45.45	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	HWY	9	46.25	45.45	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	HWY	10	46.75	45.45	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	HWY	11	44.45	45.45	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	HWY	12	45.45	45.45	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
OPERATING ENGINEER	All	HWY	13	36.90	45.45	1.5	1.5	2.0	2.0	14.45	19.75	0.00	1.65		17.93	35.85
PAINTER	All	BLD		32.45	33.95	1.5	1.5	2.0	2.0	7.45	13.67	0.00	0.70	0.00	0.00	0.00
PAINTER	All	HWY		33.65	35.15	1.5	1.5	2.0	2.0	7.45	13.67	0.00	0.70	0.00	0.00	0.00
PAINTER OVER 30 FT.	All	BLD		33.45	34.95	1.5	1.5	2.0	2.0	7.45	13.67	0.00	0.70	0.00	0.00	0.00
PAINTER PWR EQMT	All	BLD		33.45	34.95	1.5	1.5	2.0	2.0	7.45	13.67	0.00	0.70	0.00	0.00	0.00
PAINTER PWR EQMT	All	HWY		34.65	36.15	1.5	1.5	2.0	2.0	7.45	13.67	0.00	0.70	0.00	0.00	0.00
PILEDRIVER	All	ALL		43.52	46.02	1.5	1.5	2.0	2.0	10.00	10.55	0.00	0.70		0.00	0.00

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PIPEFITTER	NW	BLD		42.55	46.55	1.5	1.5	2.0	2.0	10.21	10.85	0.00	1.75		0.00	0.00
PIPEFITTER	SE	BLD		44.00	46.50	1.5	1.5	2.0	2.0	11.40	7.00	0.00	1.40	0.00	0.00	0.00
PLASTERER	All	BLD		36.50	38.00	1.5	1.5	2.0	2.0	11.00	12.00	0.00	0.75	0.00	11.88	23.75
PLUMBER	NW	BLD		42.25	44.75	1.5	1.5	2.0	2.0	10.95	8.40	0.00	1.70		0.00	0.00
PLUMBER	SE	BLD		44.00	46.50	1.5	1.5	2.0	2.0	11.40	7.00	0.00	1.40	0.00	0.00	0.00
ROOFER	All	BLD		37.00	39.50	1.5	1.5	2.0	2.0	9.50	10.20	0.00	0.76		0.00	0.00
SHEETMETAL WORKER	All	ALL		39.53	41.03	1.5	1.5	2.0	2.0	11.05	9.81	2.37	0.71	1.88	0.00	0.00
SPRINKLER FITTER	All	BLD		48.38	52.38	2.0	2.0	2.0	2.0	10.90	15.45	0.00	1.15		0.00	0.00
TERRAZZO FINISHER	All	BLD		28.08		1.5	1.5	2.0	2.0	9.05	7.69	1.00	0.85	0.00	0.00	0.00
TERRAZZO MASON	All	BLD		33.62		1.5	1.5	2.0	2.0	9.05	9.25	1.00	0.94	0.00	0.00	0.00
TRUCK DRIVER	All	ALL	1	42.25	46.61	1.5	1.5	2.0	2.0	15.39	7.73	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	ALL	2	42.83	46.61	1.5	1.5	2.0	2.0	15.39	7.73	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	ALL	3	43.15	46.61	1.5	1.5	2.0	2.0	15.39	7.73	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	ALL	4	43.50	46.61	1.5	1.5	2.0	2.0	15.39	7.73	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	ALL	5	44.61	46.61	1.5	1.5	2.0	2.0	15.39	7.73	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	O&C	1	33.80	37.26	1.5	1.5	2.0	2.0	15.39	7.73	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	O&C	2	34.26	37.26	1.5	1.5	2.0	2.0	15.39	7.73	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	O&C	3	34.52	37.26	1.5	1.5	2.0	2.0	15.39	7.73	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	O&C	4	34.80	37.26	1.5	1.5	2.0	2.0	15.39	7.73	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	O&C	5	35.69	37.26	1.5	1.5	2.0	2.0	15.39	7.73	0.00	0.25	0.00	0.00	0.00

Legend

Rg Region
Type Trade Type - All,Highway,Building,Floating,Oil & Chip,Rivers
C Class
Base Base Wage Rate
OT M-F Unless otherwise noted, OT pay is required for any hour greater than 8 worked each day, Mon through Fri. The number listed is the multiple of the base wage.
OT Sa Overtime pay required for every hour worked on Saturdays
OT Su Overtime pay required for every hour worked on Sundays
OT Hol Overtime pay required for every hour worked on Holidays
H/W Health/Welfare benefit
Vac Vacation

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Trng Training
Other Ins Employer hourly cost for any other type(s) of insurance provided for benefit of worker.

Explanations ST. CLAIR COUNTY

LABORERS (NORTH) - The area bounded by Route 159 to a point south of Fairview Heights and west-southwest to Route 3 at Monroe County line.

PLUMBERS & PIPEFITTERS (SOUTHEAST) - That part of the county bordered by Rt. 50 on the North and West including Belleville.

PLUMBERS (NORTHWEST) - Towns of Aloraton, Brooklyn, Cahokia, Caseyville, Centreville, Dupo, East Carondelet, E. St. Louis, Fairview Heights, French Village, National City, O'Fallon, Sauget, and Washington Park.

The following list is considered as those days for which holiday rates of wages for work performed apply: New Years Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Christmas Day and Veterans Day in some classifications/counties. Generally, any of these holidays which fall on a Sunday is celebrated on the following Monday. This then makes work performed on that Monday payable at the appropriate overtime rate for holiday pay. Common practice in a given local may alter certain days of celebration. If in doubt, please check with IDOL.

Oil and chip resealing (O&C) means the application of road oils and liquid asphalt to coat an existing road surface, followed by application of aggregate chips or gravel to coated surface, and subsequent rolling of material to seal the surface.

EXPLANATION OF CLASSES

ASBESTOS - GENERAL - removal of asbestos material/mold and hazardous materials from any place in a building, including mechanical systems where those mechanical systems are to be removed. This includes the removal of asbestos materials/mold and hazardous materials from ductwork or pipes in a building when the building is to be demolished at the time or at some close future date.

ASBESTOS - MECHANICAL - removal of asbestos material from mechanical systems, such as pipes, ducts, and boilers, where the mechanical systems are to remain.

CERAMIC TILE FINISHER AND MARBLE FINISHER

The handling, at the building site, of all sand, cement, tile, marble or stone and all other materials that may be used and installed by [a] tile layer or marble mason. In addition, the grouting, cleaning, sealing, and mixing on the job site, and all other work as required in assisting the setter. The term "Ceramic" is used for naming the classification only and is in no way a limitation of the product handled. Ceramic takes into consideration most hard tiles.

ELECTRONIC SYSTEMS TECHNICIAN

Installation, service and maintenance of low-voltage systems which utilizes the transmission and/or transference of voice, sound, vision, or digital for commercial, education, security and entertainment purposes for the following: TV monitoring and

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surveillance, background/foreground music, intercom and telephone interconnect, field programming, inventory control systems, microwave transmission, multi-media, multiplex, radio page, school, intercom and sound burglar alarms and low voltage master clock systems.

Excluded from this classification are energy management systems, life safety systems, supervisory controls and data acquisition systems not intrinsic with the above listed systems, fire alarm systems, nurse call systems and raceways exceeding fifteen feet in length.

OPERATING ENGINEER - BUILDING

GROUP I

Cranes, Draglines, Shovels, Skimmer Scoops, Clamshells or Derrick Boats, Pile Drivers, Crane-Type Backhoes, Asphalt Plant Operators, Concrete Plant Operators, Dredges, Asphalt Spreading Machines, Screws on Asphalt Spreading Machines, All Locomotives, Cable Ways or Tower Machines, Hoists, Hydraulic Backhoes, Ditching Machines, or Backfiller, Cherrypickers, overhead Cranes, Roller, Steam or Gas, Concrete Pavers, Excavator Concrete Breakers, Concrete Pumps, Bulk Cement Plants, Cement Pumps, Derrick-Type Drills, Boat Operators, Motor Graders or Pushcats, Scoops or Tournapulls, Bulldozers, Endloaders or Fork Lifts, Power Blade or Elevating Graders, Winch Cats, Boom or Winch Trucks or Boom Tractors, Pipe Wrapping or Painting Machines, Asphalt Plant Engineer, Journeyman Lubricating Engineer, Drills (other than derrick type), Mud Jacks, or Well Drilling Machines, Boring Machines or Track Jacks, Mixers, Conveyors (two), Air Compressors (two) Water Pumps, regardless of size (two), Welding Machines (two), Siphons or Jets (two), Winch Head or Apparatuses (two), Light Plants (two), Waterblasters (two), all Tractors, regardless of size (straight tractor only), Fireman on Stationary Boilers, Automatic Elevators, Form Grading Machines, Finishing Machines, Power Sub-Grader or Ribbon Machines, Longitudinal Floats, Distributor Operators on Trucks, Winch Heads or Apparatuses (one), Mobil Track air and heaters (two to five), Heavy Equipment Greaser, Relief Operator, Assistant Master Mechanic and Heavy Duty Mechanic, Autonomous and semi-autonomous equipment, concrete saws of all types and sizes with their attachments, gob-hoppers, excavators all sizes, the repair, greasing, and fueling of all diesel hammers, the operation, set-up and cleaning of bidwells, concrete placement booms, the alterations, repair of all barges, water blasters of all sizes and their clutches, mobile lifts, hydraulic jacks where used for hoisting, diesel or gas powered flashing signs used for traffic control, micro pavers, log skiders, iceolators used on and off of pipeline, condor cranes, drill rigs of all sizes, bow boats, survey boats, ross carriers, bob-cats and all their attachments, skid steer loaders and all their attachments, creter crane, direct drive electric motors the bolting and unbolting the adjusting and shimming, (dewatering jobs, whirley crane, conveyor belts) etc., batch plants (all sizes), roto mills, conveyors systems of any size and any configuration, hydroseeders and straw-blowers all sizes, operation, repair, service of all vibratory hammers, all power pacs and their controls regardless of location, curtains or brush burning machines, stump cutter machines, grout machines regardless of size, Nail Launchers when mounted on a machine or self-propelled, con-cover machines, Goldhofer and similar S.P.M.T. (self-propelled modular transporters) heavy transport units and all Operators
(except those listed below).

GROUP II
Assistant Operators

GROUP III
Air Compressors (one), Water Pumps, regardless of size (one), Water-blasters (one), Welding Machine (one), Mixers (one bag),

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Conveyor (one), Siphon or Jet (one), Light Plant (one), Heater (one), Immobile Track Air (one), and Self-Propelled Walk Behind Rollers.

GROUP IV
CCO-17 ton and below

GROUP V
CCO-17.5 to 35 Ton and Boom to 50'

GROUP VI
CCO-35.5 to 75 Ton and Boom to 100'

GROUP VII
CCO-75.5 to 125 Ton and Boom to 125'

GROUP VIII
CCO- 125.5 to 200 Ton and Boom to 100'

GROUP IX
CCO-200.5 to 300 Ton and Boom to 100'

GROUP X
CCO-300.5 to 450 Ton and Boom to 150'

GROUP XI
Master Mechanic

GROUP XII
Operator Foreman, Licensed Boat Pilot

GROUP XIII
Track type hydraulic hoes & crawler gradealls prep time.

GROUP XIV
Fireman on Whirlies and Heavy Equipment Oilers, Truck Cranes, Dredges, Monigans, Large Cranes - (Over 65-ton rated capacity) Concrete Plant Oiler, Blacktop Plant oiler and Creter Crane Oiler (when required), barge tenders, oilers on drill rigs used for caisson or for pile driving and Oiler.

OPERATING ENGINEERS – Highway

GROUP I

Cranes, Draglines, Shovels, Skimmer Scoops, Clamshells or Derrick Boats, Pile Drivers, Crane-Type Backhoes, Asphalt Plant

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Operators, Concrete Plant Operators, Dredges, Asphalt Spreading Machines, Screws on Asphalt Spreading Machines, All Locomotives, Cable Ways or Tower Machines, Hoists, Hydraulic Backhoes, Ditching Machines, or Backfiller, Cherrypickers, overhead Cranes, Roller, Steam or Gas, Concrete Pavers, Excavator Concrete Breakers, Concrete Pumps, Bulk Cement Plants,
Cement Pumps, Derrick¬Type Drills, Boat Operators, Motor Graders or Pushcats, Scoops or Tournapulls, Bulldozers, Endloaders or
Fork Lifts, Power Blade or Elevating Graders, Winch Cats, Boom or Winch Trucks or Boom Tractors, Pipe Wrapping or Painting Machines, Asphalt Plant Engineer, Journeyman Lubricating Engineer, Drills (other than derrick type), Mud Jacks, or Well Drilling Machines, Boring Machines or Track Jacks, Mixers, Conveyors (two), Air Compressors (two) Water Pumps, regardless of size (two), Welding Machines (two), Siphons or Jets (two), Winch Head or Apparatuses (two), Light Plants (two), Waterblasters (two), all Tractors, regardless of size (straight tractor only), Fireman on Stationary Boilers, Automatic Elevators, Form Grading Machines, Finishing Machines, Power Sub-Grader or Ribbon Machines, Longitudinal Floats, Distributor Operators on Trucks, Winch Heads or Apparatuses (one), Mobil Track air and heaters (two to five), Heavy Equipment Greaser, Relief Operator, Assistant Master Mechanic and Heavy Duty Mechanic, concrete saws of all types and sizes with their attachments, gob¬hoppers, excavators all
sizes, the repair, greasing, and fueling of all diesel hammers, the operation, set-up and cleaning of bidwells, concrete placement booms, the alterations, repair of all barges, water blasters of all sizes and their clutches, mobile lifts, hydraulic jacks where used for hoisting, diesel or gas powered flashing sings used for traffic control, micro pavers, log skiders, iceolators used on and off of pipeline, condor cranes, drill rigs of all sizes, bow boats, survey boats, ross carriers, bob-cats and all their attachments, skid steer loaders and all their attachments, creter crane, direct drive electric motors the bolting and unbolting the adjusting and shimming, (dewatering jobs, whirley crane, conveyor belts) etc., batch plants (all sizes), roto mills, conveyors systems of any size and any configuration, hydroseeders and straw-blowers all sizes, operation, repair, service of all vibratory hammers, all power pacs and their controls regardless of location, curtains or brush burning machines, stump cutter machines, grout machines regardless of size, Nail launchers when mounted on a machine or self-propelled, con-cover machines, Goldhofer and similar S.P.M.T. (self-propelled modular transporters) heavy transport units and all Operators (except those listed below).

GROUP II
Assistant Operators

GROUP III
Air Compressors (one), Water Pumps, regardless of size (one), Water-blasters (one), Welding Machine (one), Mixers (one bag), Conveyor (one), Siphon or Jet (one), Light Plant (one), Heater (one), Immobile Track Air (one), and Self-Propelled Walk Behind
Rollers.
GROUP IV
CCO-17 ton and below

GROUP V
CCO-17.5 to 35 Ton and Boom to 50’

GROUP VI
CCO- 35.5 to 75 Ton and Boom to 100’

GROUP VII
CCO- 75.5 to 125 Ton and Boom to 75’

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GROUP VIII
CCO- 125.5 to 200 Ton and Boom to 100'

GROUP IX
CCO- 200.5 to 300 Ton and Boom to 100'

GROUP X
CCO- 300.5 to 450 Ton and Boom to 150'

GROUP XI
Master Mechanic, Working Foreman/Mechanic.

GROUP XII
Operator Foreman, licensed boat pilot.

GROUP XIII
Fireman on Whirlies and Heavy Equipment Oilers, Truck Cranes, Dredges, Monigans, Large Cranes - (Over 65-ton rated capacity) Concrete Plant Oiler, Blacktop Plant Oiler and Creter Crane Oiler (when required), barge tenders, oilers on drill rigs used for caisson or for pile driving, and Oiler.

TRUCK DRIVER - BUILDING, HEAVY AND HIGHWAY CONSTRUCTION Class 1. Drivers on 2 axle trucks hauling less than 9 ton. Air compressor and welding machines and brooms, including those pulled by separate units, truck driver helpers, warehouse employees, mechanic helpers, greasers and tiremen, pickup trucks when hauling materials, tools, or workers to and from and on-the-job site, and fork lifts up to 6,000 lb. capacity.

Class 2. Two or three axle trucks hauling more than 9 ton but hauling less than 16 ton. A-frame winch trucks, hydrolift trucks, vactor trucks or similar equipment when used for transportation purposes. Fork lifts over 6,000 lb. capacity, winch trucks, four axle combination units, and ticket writers.

Class 3. Two, three or four axle trucks hauling 16 ton or more. Drivers on water pulls, articulated dump trucks, mechanics and working forepersons, and dispatchers. Five axle or more combination units.

Class 4. Low Boy and Oil Distributors.

Class 5. Drivers who require special protective clothing while employed on hazardous waste work. TRUCK DRIVER - OIL AND CHIP RESEALING ONLY.

This shall encompass laborers, workers and mechanics who drive contractor or subcontractor owned, leased, or hired pickup, dump, service, or oil distributor trucks. The work includes transporting materials and equipment (including but not limited to, oils, aggregate supplies, parts, machinery and tools) to or from the job site; distributing oil or liquid asphalt and aggregate; stock piling material when in connection with the actual oil and chip contract. The Truck Driver (Oil & Chip Resealing) wage classification does not include supplier delivered materials.

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TERRAZZO FINISHER

The handling of all materials used for Mosaic and Terrazzo work including preparing, mixing by hand, by mixing machine or transporting of pre-mixed materials and distributing with shovel, rake, hoe, or pail, all kinds of concrete foundations necessary for Mosaic and Terrazzo work, all cement terrazzo, magnesite terrazzo, Do-O-Tex terrazzo, epoxy matrix ter-razzo, exposed aggregate, rustic or rough washed for exterior or interior of buildings placed either by machine or by hand, and any other kind of mixture of plastics composed of chips or granules when mixed with cement, rubber, neoprene, vinyl, magnesium chloride or any other resinous or chemical substances used for seamless flooring systems, and all other building materials, all similar materials and all precast terrazzo work on jobs, all scratch coat used for Mosaic and Terrazzo work and sub-bed, tar paper and wire mesh (2x2 etc.) or lath. The rubbing, grinding, cleaning and finishing of same either by hand or by machine or by terrazzo resurfacing equipment on new or existing floors. When necessary finishers shall be allowed to assist the mechanics to spread sand bed, lay tarpaper and wire mesh (2x2 etc.) or lath. The finishing of cement floors where additional aggregate of stone is added by
spreading or sprinkling on top of the finished base, and troweled or rolled into the finish and then the surface is ground by grinding machines.

Other Classifications of Work:

For definitions of classifications not otherwise set out, the Department generally has on file such definitions which are available. If a task to be performed is not subject to one of the classifications of pay set out, the Department will upon being contacted state which neighboring county has such a classification and provide such rate, such rate being deemed to exist by reference in this document. If no neighboring county rate applies to the task, the Department shall undertake a special determination, such special determination being then deemed to have existed under this determination. If a project requires these, or any classification not listed, please contact IDOL at 217-782-1710 for wage rates or clarifications.

LANDSCAPING

Landscaping work falls under the existing classifications for laborer, operating engineer and truck driver. The work performed by landscape plantsman and landscape laborer is covered by the existing classification of laborer. The work performed by landscape operators (regardless of equipment used or its size) is covered by the classifications of operating engineer. The work performed by landscape truck drivers (regardless of size of truck driven) is covered by the classifications of truck driver.

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
4. Purchase contracts.
5. Owner-furnished products.
6. Contractor-furnished, Owner-installed products.
7. Access to site.
8. Coordination with occupants.
9. Work restrictions.
10. Specification and drawing conventions.
11. Miscellaneous provisions.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

2. Section 01 10 00 “Project Summary – Bid Packages / Schedule” for bid package coordination and project schedule.

1.3 PROJECT INFORMATION

A. Project Identification: Police Station Addition to the Caseyville Village Hall

B. Project Location: 909 S. Main Street, Caseyville, IL 62232

C. Owner: Village of Caseyville
1. Owner's Representative: Brian Rader, Director of Public Works

D. Architect: AAIC inc., One Design Mesa, Collinsville, IL 62234
1. Architect’s Representative: Chad J. Morris, AIA, NCARB, LEED Green Associate

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

B. Renovation scope.
1. As (defined in plans) and included in multiple Bid Packages. Removal of interior walls, doors, door frames, hardware. Removal of damaged floor tile, carpet, and vinyl composition. Removal of gypsum board ceiling, acoustical panels, and grid work. Removal of service counter, interior service windows, and exterior windows. Removal of lighting, switches, outlets, and data wiring and outlets. Removal of existing concrete slab as required for new footings. Removal of existing asphalt shingles roof system, replacement of damaged roof substrate, removal of selective soffit. Plumbing relocation of pipe in community center. Modification of the existing Fire Suppression system to cover new layout. Modification of existing Mechanical system to support new office design, Construction of new interior walls, paint, flooring, acoustical ceiling, grid work, new interior service windows, doors, frames, and hardware. Electrical and Technology move existing technology equipment to new TR, new surveillance cameras, placement of new wiring and data lines, lighting, switches, outlets to support new office layout. Placement of columns and structural steel to support community center roof trusses. New standing seam metal roof system. New bituminous parking area.

C. Caseyville New Police Station Scope.
1. Site Scope. Existing parking lot demolition, underground utilities, construction fencing (temp and permanent), construction access road, rough grading, pad ready including underground rough-ins, new parking lot with curbs, and markings, manholes, exterior site lighting, sidewalks, finish grading, security fencing, chain link fencing, exterior concrete pads for equipment. Site clearing, common work results for Plumbing, Water, Utilities, Electrical, Sanitary waste, Sewers, and venting. Storm drain piping, Earth moving, backfill, Erosion control, Excavation support and protection, Fencing (temp and permanent), Site lighting, Concrete paving, Asphalt paving, Joint sealants, Cast in place Concrete, Concrete reinforcing, Under slab vapor barrier, Soil preparation, turfs, and grasses.

2. Building Shell Scope. Building shell and roof components for a fully weather tight system, foundation, slab on grade, exterior and interior masonry, wood trusses, concrete footings, steel columns and beams, exterior sheathing, waterproofing, standing seam metal roof. New CMU walls, interiors walls, ceilings, openings, and finishes. Cast in place concrete, concrete reinforcing, cast stone masonry, metal fabrication, steel joist framing, steel deck, fabricated wood trusses, rough carpentry, sheathing, waterproofing, thermal insulation, metal panel wall and ceiling system, vapor barriers, standing seam metal roof, roof accessories, metal flashing, and trim, firestopping, joint sealant, expansion control.

3. Interior Scope. Provide new floor tiles, carpet, metal studs, insulation, drywall, doors and frames, steel columns and beams in community center, painting, floor

base. Village Hall construction to be sequenced with New Police Station work. New Police Station fit-out work includes interior metal stud partitions, drywall, painting, flooring, ceilings, casework, toilet accessories including domestic and detention, metal wall panel and ceiling panel system, windows systems, sectional doors, fire extinguishers and cabinets. Detention enclosures, rough carpentry, sheathing, cabinets, insulation, acoustical joint sealant, expansion control, doors, frames, and hardware, access doors, storefronts, windows, glazing, mirrors, casework, louvers, gypsum board, acoustical ceiling, base, and accessories, tile flooring, tile, carpet, interior, and exterior painting, signage, toilet compartments, lockers, wall, and door protection, fire protection cabinets, fire extinguishers, metal lockers, louver blinds, entrance grilles, detention furniture.

4. Fire suppression (wet and dry) Systems to be stand-alone systems. Provide new fire protection system for Police station that includes a dry pipe system in the attic space, vestibules, sally port. Provide balance of spaces with wet pipe system. Provide all associated fire protection equipment for wet and dry system including backflow preventor, fire department connection, exterior drain with splash block, nitrogen system.

5. Plumbing Scope. Under slab sanitary system, floor drains, floor cleanouts, trench drains, solid interceptor, yard cleanouts. Above floor plumbing system showers, sinks, toilet accessories, backflow prevention, Roof drainage connecting to underground storm system. Plumbing installation, and fixtures, domestic water heater, natural gas piping, sanitary waste vents, and piping, sanitary sewer piping, water piping, facility distribution piping, identification for plumbing piping, and equipment, seismic protection, hangers, and supports, general duty valves for plumbing piping, meters, gauges, common work results for plumbing, and plumbing equipment.

6. Mechanical Scope. Mechanical system to be a stand-alone system. New RTU,s, roof mounted exhaust fans, unit heaters, split-system unit, condensing unit, radiant tube heater, VAV boxes, air terminals, diffusers, mechanical control system and accessories to provide a fully functional mechanical system. Common work results for mechanical, variable frequency drives, valves, meters, and gauges, for HVAC piping, hangers , and supports, seismic controls for HVAC piping and equipment, identification for HVAC piping, and equipment, testing, adjusting, and balancing of HVAC system, mechanical insulation, instrumentation, and controls, refrigerant piping, metal ducts, air power accessories, diffusers, registers, and grilles, electronic air cleaners, HVAC controls.

7. Electrical Scope. Provide new power and lighting components for Village Hall work areas and New Police Station. Systems to be stand-alone systems. New Police Station to include grounding system, power systems, site electric and lighting, power, and low voltage for all Mechanical and Plumbing systems. All systems and technology components, all associated switch gear and panels for fully operational system, fire alarm components. All service, under slab, above slab, and site electrical work. All systems including but not limited to; AV systems, Fire Alarm systems, interior/exterior cameras and system,

communications systems, access control systems, cable/data racks and equipment. Include all equipment or housekeeping pads for own equipment per manufacturers recommendations. Building wire, and cable, grounding, bonding for electrical system, cabinets , and enclosures, supporting devices, raceways, boxes for electrical system, seismic and vibration controls, lighting control devices, switchboards, panel boards, motor controls, equipment wiring, enclosed switches, engine generator system, transfer switches, lighting protection for structure, surge protection devices, luminaires, site lighting, testing of all electrical systems, communication raceway system, A/V distribution system, access control systems, IP video recording and surveillance system.

8. Project will be constructed under:
   a. Multiple Bid Package contracts.
      1) Bid Package 01 – SITE
      2) Bid Package 02 – BUILDING SHELL
      3) Bid Package 03 – INTERIOR
      4) Bid Package 04 – FIRE SUPPRESSION
      5) Bid Package 05 – PLUMBING
      6) Bid Package 06 – MECHANICAL
      7) Bid Package 07 – ELECTRICAL

1.5 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

B. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with work under these Contracts and will be coordinated with all contractors.

1.6 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to within units approved for work by Owner.
2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, emergency vehicles, and neighboring property owner at all times. Do not use these areas for parking or storage of materials.

   a. Schedule deliveries to minimize use of driveways and entrances by construction operations.

b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.7 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work on the existing building to normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated.

C. Existing Utility Interruptions: Owner will interrupt utilities serving facilities occupied by Owner or others as requested. Provide not less than two days prior notice of need for service interruption.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy or adjacent residences with Owner.
1. Notify Owner of operations generating noise, vibration, or odors a minimum of 48-hours in advance.

E. Controlled Substances: Use of tobacco products and other controlled substances on the Project Site is not permitted.

F. Employee Identification: Contractor shall provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications and to all Bid Package contractors.

C. The use of the term General Contractor shall be interpreted as Prime Contractor or Bid Package Contractor throughout the specifications.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Keyed noting: Materials and products are identified by reference keyed notes referencing information found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 10 01 – PROJECT SUMMARY – BID PACKAGES / SCHEDULE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 INSURANCE, DESIGNATED PURCHASER

A. Contractors shall purchase and maintain property and builders risk insurance and coverage indicated in section 00 73 00.

1.3 SUMMARY

A. Section Includes:

1. Project information.
2. Special Conditions.
3. Safety of Persons & Property
4. Project Schedule.
5. Concurrent Work.
6. Coordination of Work.
7. Contract Method.
8. Contractors Use of Premises.
9. Description of Work & Work Packages.

1.4 PROJECT INFORMATION

A. Project Identification: Police Station Addition to the Caseyville Village Hall
    1. Project Location: 909 S. Main Street, Caseyville, IL 62232

B. Owner: Village of Caseyville, 909 S. Main Street, Caseyville, IL 62232
    1. Owner's Representative: Brian Rader, Director of Public Works

C. Architect: AAIC Inc. One Design Mesa Collinsville, IL 62234

D. Architect’s Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents.
    1. Structural Engineer: IMEG
    2. Mechanical, Electrical, Plumbing, Fire Protection Engineer: IMEG

E. Civil Engineer: Sherbut-Carson-Claxton, LLC

F. Construction Manager: AAIC Inc.

1.5 SPECIAL CONDITIONS

A. The scope of Work in each bid package includes the following Special Conditions in addition to all work shown or described in the individual bid packages and shown in the construction documents. The following items are to be included within the bid of each Contractor and will subsequently be considered part of every contract.

B. All work to be governed and controlled by local, state and federal requirements for air pollution and disturbance of surrounding areas.

C. All work on this site is to be performed safely in accordance with all Occupational Safety and Health Administration (OSHA) standards. See **1.6** of this specification section. It is the responsibility of all contractors to inform and educate all personnel working on site of the aforementioned requirement and ensure that these policies are enforced each day.

D. The Storm Water Pollution Prevention Plan (SWPPP) is part of the construction documents and is incorporated herein. It is the responsibility of all contractors to review and understand the requirements of the NPDES General Permit.

E. Prior to working at the site, all employees of the contractors must be trained in SDS policies and procedures. SDS/HAZCOM information is to be supplied to the Construction Manager prior to delivery of material on site.

F. The Owner shall require all trade contractors name the Owner, Architect and Construction Manager as additional insured on required liability policies on a primary basis on both General Liability and Umbrella. Policy Limits are in section 00 73 00 Insurance Requirements.

G. The Owner shall require all trade contractors and suppliers provide a dual oblige rider to the performance and payment bonds naming the Owner and Construction Manager.

H. The Owner reserves the right to refuse or reject any or all bids.

I. To the fullest extent of the allowed by law, the contractor shall indemnify, hold harmless and defend the Owner, Construction Manager and its directors, officers, agents, employees, representatives, insurers, servants, successors, affiliates and permitted assigns from and against suits, losses, demands, claims, liability, causes of action, claims for indemnity or contribution, costs and expenses for bodily injury (including death) or property damage, to the extent such claims arise out of or are caused by the negligent acts, negligent omissions or willful misconduct of the Contractor or its employees, agents and subconsultants in the performance of the Services hereunder. It is expressly agreed and understood that any approval by any of the Indemnified Parties of the Services performed by the Contractor shall not operate to limit the obligation of the Contractor assumed in these documents.

J. In any court proceeding or other action brought by one party against the other to enforce or interpret the terms of the contract agreement or resolve any dispute

concerning any part of the services, the party prevailing in such a proceeding or action shall be entitled, in addition to such other relief the court or arbitrators may grant to an award of its costs incurred in connection with the proceedings, including reasonable fees and disbursements of its attorneys. In any court proceeding or other action brought by one party against the other to enforce or interpret the terms of the contract agreement or resolve any dispute concerning any part of the services, the action shall be filed in the Circuit Court of St. Clair, Illinois or in the United States District Court for the Southern District of Illinois, if federal jurisdiction exists.

K. If a contractor should find it necessary to work over the weekend, notify the Construction Manager prior to 4:00 p.m. Thursday before the weekend to be worked.

L. The contractor shall submit a Daily Manpower Report in prescribed form, to the Construction Manager. This report shall include a brief description of the contractor's activities for the day and a manpower count both the contractor and any subcontractors.

M. The storage of materials and equipment at the site shall be permitted only to the extent approved in advance by the Construction Manager in conformance with the limited established any local ordinances and laws. If materials and equipment so stored obstruct the progress of any portion of the work, they shall be removed or relocated by the respective contractors as may be directed by the Construction Manager, without reimbursement of cost.

N. Each Contractor shall be represented at the site by a competent full-time superintendent/foreman from the beginning of the work until acceptance unless otherwise instructed by the Construction Manager.

O. Dumpsters will be provided by the Construction Manager for the use of building material debris only. No spoils, concrete, bricks/CMU blocks, or roofing material will be permitted to dispose in the Owners' provided dumpsters. The Contractor responsible for the cleanup of the aforementioned materials under their scope of work will be held accountable for the proper disposal of said items. Burning or dumping of any rubbish, debris, or waste material on the jobsite or adjoining property will not be permitted. Each Contractor shall place all debris created by this work in the provided dumpster unless otherwise dictated in the Bid Package description. In the event a dispute arises among the Contractor and any others as to the responsibility for clean-up, the Construction Manager may cause the clean-up to be done and allocate the costs among the parties responsible for keeping the premises and surrounding areas free of accumulation of waste or rubbish. The allocation made by the Construction Manager shall be binding on the Contractor.

P. The Architect/Owner and his representatives shall at all times have access to the work whenever it is in preparation or progress and this Contractor shall provide proper and safe facilities for such access and inspection or testing.

Q. Construction parking will only be allowed in limited temporary parking areas as designated by the Construction Manager.

R. Each contractor shall submit to the Construction Manager a monthly requisition for payment on a preapproved schedule of values. This requisition shall be incorporated into AIA documents G702 CMa and G703 CMa form.

S. Each Contractor's allowable mark-up on change order work will be limited to the following:

1. Labor and material for work performed by own forces – 10% (Includes overhead and profit).

2. Labor and material for work performed by Subcontractors – 5% (Includes overhead and profit).

T. The following work is the responsibility of the respective contractor:

1. Cut and Fill/Earthwork.
2. Elevation and locations for Site Sanitary
3. Elevation and locations for Site Waters
4. Elevation and locations for Site Electrical
5. Elevation and locations for Site Storm Sewer
6. Site concrete elevations and back of curbs

U. Each contractor shall be responsible for layout of their work for installation. For site related work, each contractor shall be responsible for layout and control work from established controls.

V. Each contractor shall become familiar with the subsurface investigation of this project as well as all other sections.

W. Each contractor is responsible for all hoisting and unloading of their material and equipment. Contractors are responsible to receive, unload and set any owner supplied material that is a part of the scope of work and bid package.

X. Temporary toilets and site fencing will be provided by the Construction Manager.

Y. Each contractor shall provide all required traffic control signs and flagmen throughout the contractor's operations.

Z. All contractors are required to attend all job progress and coordination meetings with the superintendent and project manager. If a contractor fails to attend the weekly jobsite meetings as scheduled, the Construction Manager at his/her discretion will back charge the contractor $500.00 per each occurrence. Also, if a contractor fails to attend the weekly meeting, they will waive all rights for future claims on items discussed and agreed to in the meeting.

AA. Consumption of alcohol or the use of tobacco on this site will not be permitted. The Construction Manager reserves the right to remove anyone from the site for consumption of alcohol or tobacco usage.

BB. If a contradiction in the contract documents occurs, then the more expensive interpretation shall prevail and be inclusive in that respective contractor's bid.

CC. Since this is an open site, every effort must be made to close up all excavations on the same day they are started. However, if an open excavation cannot be backfilled on the same day the responsible Contractor shall protect the general public by utilizing safety barricades as outlined in OSHA standards, including but not limited to perimeter snow fence, covering, and securing the opening. This protection must be maintained throughout the excavation and backfill period and in place at the end of each working day. The cost for this shall be included in the contractor's bid.

DD. Out of sequence work requested by the Owner, Architect or Construction Manager to meet job occupancy requirement or to allow beneficial use of the building to the Owner is included in the respective contractors bid. No change orders will be issued for out of sequence work.

EE. It is the responsibility of each contractor bidding this project to become familiar with all the bid packages included in this project as well as all the Construction Documents.

FF. Each Contractor must provide daily work tickets for approval by the Construction Manager for any authorized extra work. Failure to provide such tickets may result in the contractor performing such work at its own risk for no additional cost.

GG. Each contractor will be required to work overtime at its own expense to maintain the project schedule or the Construction Managers three-week schedules. Contractors will also be required to work overtime, at their own expense to make up for delays or failure to meet performance commitments.

HH. Each Contractor shall coordinate the work of his Bid Package with the work of other Bid Packages so that all work is completed in accordance with the Contract Documents and schedule is maintained. Rework that is required due to insufficient coordination with other contractors will be performed at the Contractor's cost.

II. The responsibilities of each contractor are intended to coincide with the other bid packages to provide a complete and total project. It is the responsibility of each contractor to become familiar with all the bid packages and all the construction documents included in the project and identify any discrepancies of misunderstanding that may exist prior to issuance of their respective bid.

JJ. All Contractors shall perform their work in such a manner, and in such a sequence that is most beneficial to the overall project. The Construction Manager may direct the sequence of the work at no additional cost to the Owner.

KK. It is understood by all bidders that there is not a "General Contractor" overseeing the work of this project. As such each contractor shall coordinate with each other to ensure all building systems are coordinated properly.

LL. If the term General Contractor is found in the Contract Documents, it is understood that it refers to the individual contractor performing the work of the specified Bid Package.

LL. Provide necessary labor for all work jurisdictionally claimed by building trades in your employ for work integral to the Work Packages.

MM. Provide shop drawings and submittals as required by the specifications but in no case later than ten (10) calendar days from notice to proceed.

NN. Submittal processing software and/or website will be provided by the Construction Manager for use by all contractors throughout the project.

QQ. Each contractor is responsible for the complete contents of the general notes for this project as shown on the construction documents.

RR. The owner will apply for all permits. It will be the responsibility of the contractor to pay for and pull the contractor's respective permit. The contractors shall participate as required to provide the necessary information to obtain the permits and taps. All contractor permits, fees, patents, etc. required by state and municipal requirements shall be paid for by the respective contractors or subcontractors as the case may be.

SS. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

TT. Each contractor must use caution around existing finishes and new finishes and must provide protection as needed to avoid property damage.

UU. Each Contractor shall provide Bidding and Construction Documents for their own use and the use of any subcontractors. It is the responsibility of each contractor to keep Construction Documents updated with current revisions, bidding and post-bid addendums, RFI's, ASI's, et al.

VV. Each contractor shall provide Safety – Hard Hats / PPE for all workers on site as stated in Section 1.6. OSHA requirements will supersede any safety concerns.

XX. Each Contractor shall provide Drinking Water for their workers on site. The Construction Manager will not be providing drinking water for the project.

YY. Each Contractor shall provide Cranes/Hoists/Elevators/Man-Lifts as need to complete their scope of work.

ZZ. Each Contractor shall provide Barricades/Traffic Control as needed to ensure the public safety as it relates to your scope of work.

AAA. Each Contractor shall provide large and small tools to complete any or all work associated with these bid packages.

BBB. Each Contractor shall provide street cleaning as it relates to this bid package. This would include any and all deliveries made to the contractor.

CCC. Each Contractor shall provide Operation & Maintenance Manuals within 10 days of substantial completion.

DDD. Each Contractor shall provide As-Built Drawings within 10 days of substantial completion.

EEE. Each Contractor shall provide General & Excess Liability Insurance.

FFF. Each Contractor shall provide Owner On-Site Training within 10 days of substantial completion.

GGG. Each contractor will be responsible for all of the following specification sections:

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS
DIVISION 01 – GENERAL REQUIREMENTS

1.6 SAFETY OF PERSONS AND PROPERTY

The contractor is required to perform all contracted work in a safe and reasonable manner. The contractor shall seek to avoid injury, loss or damage to persons or property by taking reasonable steps to protect:

(a) employees, public, and other persons visiting the site.

(b) materials and equipment stored at the site or at off-site locations for use in performance of the contracted work.

(c) all property and structures located at the site and adjacent to the work areas, whether or not said property or structures are part of the project or involved in the contracted work.

The contractor shall retain primary responsibility for its work and its employees. Each contractor shall provide to the Construction Manager the following documents:

(a) Weekly safety ‘tool-box talks’ training documentation for each site employee with signatures.

(b) Accident, incident, &/or near miss reports within 24 hours of an occurrence.

(c) Site specific SDS, prior to start of work.

(d) Company safety program and policies, prior to start of work.

The contractor shall attend a safety orientation training program for each new hire on the jobsite prior to beginning any work. This orientation is sanctioned by the owners of the

project and will update you to the site-specific rules which apply as well as current hazards on the project.

The contractor shall give all required notices and comply with all applicable rules stated in the company safety manual, minimum OSHA regulations, and any site-specific rules sanctioned by the owner. In addition, other safety requirements maybe dictated by insurance and/or risk management that additionally is used to prevent injury, loss, or damage to persons or properties.

The contractor shall implement appropriate safety measures pertaining to the contract work and the project, including establishing safety rules, posting appropriate warnings and notices, erecting safety barriers, and establishing proper notice procedures to protect persons and property at the site, pedestrians in the area, and visitors to the site from injury, loss or damage.

The contractor is required to promptly remedy any loss or damage caused to the work, materials, equipment and property referred to, if said loss or damage is not covered by insurance required under the contract, but only to the extent caused in whole or in part by the contractor and/or persons or entities performing work for or on behalf of the contractor, regardless of tier, who have furnished labor, materials or services relating to the contract and for whose acts the contractor may be liable.

The contractor shall not be required to remedy any loss or damage which is not attributable to the fault or negligence of the contractor or of any person or entity for whose acts the contractor may be liable.

The contractor is responsible for all subcontractor tiers hired by the company below them for proper safety compliance.

The contractor is required to designate an individual at the site who shall act as the contractor’s designated safety representative and meet OSHA’S ‘competent person’ requirements. This person will have the power to identify hazards and stop any work out of compliance. Unless otherwise identified by the contractor in writing to AAIC, the designated safety representative shall be the contractor’s project superintendent/foreman.

The contractor is required to designate an individual at the site who shall act as the English Speaking Representative. This individual is required to be on-site at all times when work is taking place. The Representative will be able to clearly communicate with all employees of said contractor and must meet the definition of ‘Competent Person’ as defined by OSHA regulations.

The contractor has an affirmative duty not to overload the structures or conditions at the site and shall take reasonable steps not to load any part of the structure, or site so as to give rise to an unsafe condition or create an unreasonable risk of personal injury or property damage.

The contractor shall give prompt written notice to the Construction Manager of any accident involving personal injury requiring a physician’s care, any property damage, or

any failure that could have resulted in serious personal injury, whether such an injury was sustained.

Prevention of accidents at the site is the responsibility of the Contractor, and all subcontractors, persons and entities at the site. The contractor shall establish and submit in print its own safety program implementing safety measures, policies and standards conforming to those required or recommended by OSHA, EPA, or other governmental authorities having jurisdiction as well as by the construction manager and owner, including, but not limited to, requirements imposed by the contract documents. The contractor's Safety Program will be placed on file by the Construction Manager prior to starting work on the project. The contractor is required to adhere to the most stringent safety rules on each project imposed by either the CM, Owner, Insurance Company, OSHA, or personal company policies. The contractor shall comply with the reasonable recommendations of insurance companies having an interest in the project and shall stop any part of the contract work which the construction manager deems unsafe until corrective measures satisfactory to the CM have been taken.

Contractors are required to implement an aggressive Fall Protection Plan to include conventional fall protection in all cases where work is being performed 6' or more above a lower surface. Conventional fall protection includes the use of body harness, correct lanyard, anchor point, guardrails, netting, or barricades. This rule pertains to all steel erection activities, roofing, and work from scaffolding. All roofing contractors utilizing a Controlled Access Zone (CAZ) in lieu of conventional fall protection can submit a site-specific safety plan conforming to the OSHA guidelines (CFR 1926-502)..

Personal protective equipment (PPE) is required to be used by all contractors on the project. At a minimum 100% use of ANSI approved hard hats, class 2 reflective vest or equivalent and safety glasses are required at all times. This applies to all contractors, subcontractors, suppliers, delivery persons, salespersons, truck drivers and any other persons requiring access to the jobsite. In addition, all workers are required to wear full length pants, shirts with 4" sleeves and minimal tearing, and heavy-duty boots. The lack of availability of this PPE is grounds for denial of access to the project. A violation of the basic PPE requirements is subject to written warning and then removal from the project. The CM maintains the right to remove any employee from the jobsite due to inadequate use of PPE or violation of any of the above rules.

SAFETY DATA SHEETS

A hard copy of all Safety Data Sheets (SDS's) as required by law and pertaining to materials or substances used or consumed in the performance of the contract work shall be submitted to the CM by the contractor.

SDS's obtained by the CM from other contractors or sources will be made available to the contractor by the CM.

Contractors are required to provide all necessary and required PPE for all their employees as stated by CM and OSHA requirements. In addition, contractors are required to furnish their own first-aid kits, eye wash stations, and fire extinguisher equipment.

Contractors are required to submit weekly jobsite training sessions (tool-box talks) to the CM on a weekly basis. Copies of the safety meetings must contain topics covered, safety information, employee signature and dates.

Contractors shall be responsible to ensure that all secondary tiers of the contractor abide by the CM's safety requirements and additionally submit their specific SDS's and safety programs.

The CM reserves the right to remove any employee from its jobsite for any violation of the safety policies and procedures on behalf of the owner.

Hot-work permits are required for any open flame or spark producing activities. A designated fire watch must be identified in the permit and the designee must observe the area in which the hot work was taking place. Hot work permits can be submitted by the contractor, or a copy will be given out by the CM. Additionally a copy of the permit must be submitted to the CM prior to work commencing.

Riding on machinery is strictly prohibited on site. This includes riding in the back of pick-up truck beds or on tailgates. The maximum speed limit on any jobsite is 10 MPH by any vehicle.

Any workers or personnel exposed to live vehicular traffic or setting up traffic controls are required to wear high visibility reflective vests and clothing and follow all rules in accordance with the government Manual for Uniform Traffic Control Devices (MUTCD) and OSHA.

For contractors using cranes on site a designated and qualified crane signaler and rigger is required in accordance with OSHA CFR 1926-1400.Operator will designate a "No Entry" safe area while the crane is in operation. Additionally, contractors are required to submit the crane annual certification as well as the operator's CCO card (Certified crane operator).

1.7 PROJECT SCHEDULE

A. Contractor shall perform the contract work in accordance with the Project Schedule attached at the end of this specification.

1.8 NOT USED

1.9 CONCURRENT WORK

A. Work to be scheduled and coordinated with other work being performed concurrently with this work. Work that may be concurrent includes but is not necessarily limited to the following:

    1. Under slab plumbing and electrical.
    2. Site utilities.

3. Site electric.
4. Site grading and storm sewer and sanitary sewer.
5. Concrete.
6. Masonry.
7. Structural steel.
8. General building exterior.
9. Interior finishes.

1.10 COORDINATION OF WORK:

A. Contractor shall verify dimensions and elevations of work performed under previous contracts. Contractor shall notify the Construction Manager immediately of any conflict in elevation or dimension. Verification shall be done in advance such that Contractor's work is not delayed.

B. This Contractor shall be responsible for repair and/or replacement of work of other Contractors damaged by the contractor's work.

C. This Contractor shall be responsible for the cost to reestablish Owner supplied layout, dimensions and elevations destroyed through his construction activities.

C. Protect all work from collecting water and any water damage.

1.11 CONTRACT METHOD:

A. The Owner intends:

1. To award separate contracts in connection with this project.

2. To provide a full-time Construction Manager acting as defined in the AIA Document A232/CMa.

B. Contractor work shall be performed concurrently with and/or in close coordination with work performed on the project by other contractors.

C. Each Contractor is required to review all contract documents to determine scope of work, to be familiar with other Contractor responsibilities and report any inconsistencies or discrepancies immediately.

D. AIA Document A232-2019) "General Conditions of the Contract for Construction, Construction Manager as Adviser Edition" are hereby made a part of these specifications.

E. The extent of the work of each Contract is briefly enumerated under "Description of Work" & "Bid Packages" but is not necessarily limited to this summary description.

1.12 CONTRACTOR USE OF PREMISES:

A. Confine operations at site to areas permitted by:

1. Law.
2. Permits.
3. Contract.

a. Confer with Construction Manager and obtain full knowledge of all site rules and regulations affecting work.

b. Conform to site rules and regulations while engaged in project construction.

c. Site rules and regulations take precedence over others that may exist outside such jurisdiction.

d. Employee list: The Construction Manager may examine Contractor's list of employees, including those of his subcontractors and their agents.

e. Vehicle use: Rigidly enforce the following:

1. Parking: Permitted only in areas designated by representative.

2. All traffic control subject to Construction Manager's site representative's approval.

B. Do not unreasonably encumber site with materials or equipment.

C. Assume full responsibility for protection and safekeeping of products stored on premises.

D. Move all stored products or equipment which interferes with operations of Owner or other contractors.

E. Obtain and pay for use of additional storage or work area needed for operations.

F. Use of Site: Exclusive and complete, for execution of work, except as otherwise indicated or directed by the Construction Manager.

G. Construction Manager will allow reasonable access to the site and shall not prohibit nor interfere with lawfully conducted inspections or site visits by properly identified representatives of regulatory agencies or collective bargaining units.

1. Notwithstanding the above, Owner regulation governing site security shall be observed.

2. All site visitors shall comply with personal protection equipment regulations, including hard hats.

H. Fire Protection:

1. Fires: Each Contractor shall prohibit the lighting of fires about the premises and use due diligence to see that such prohibition is enforced. Debris and waste materials shall not be burned at the construction site but shall be promptly removed to prevent the accumulation of combustibles on the site or within the building.

2. Welding and Cutting: It shall be the responsibility of each Contractor to take precautionary measures to prevent fire. Hot work permits are required for any open flame or spark-producing activities.

3. Flammables: Gasoline and other fuels shall be kept and handled in accord with NFPA and in UL Listed and Labeled safety cans and shall be stored away from hazardous work areas.

1.13 DESCRIPTION OF WORK

A. The contract work is to be performed in strict accordance with the drawings and specifications herein enumerated.

B. Bid Categories: The bidding documents consider the preparation of bids for specific portions of the work separated by bid category. Each bid package covers the contract work for various bid categories summarized below. The scope of work for each bid package includes furnishing all materials, equipment and labor necessary, inherent or incidental, to fulfill the requirements summarized below and in accordance with the drawings and specifications as described herein.
A bid proposal may be submitted for any one bid package referenced herein or any combination of multiple bid packages (if applicable).

C. Bid Packages:

1. Bid Package No. 01 – SITE

2. Bid Package No. 02 – BUILDING SHELL

3. Bid Package No. 03 – INTERIOR

4. Bid Package No. 04 – FIRE SUPPRESSION

5. Bid Package No. 05 – PLUMBING

6. Bid Package No. 06 – MECHANICAL

7. Bid Package No. 07 - ELECTRICAL

WORK PACKAGES

BID PACKAGE NO. 01 – SITE
Includes Allowance 4 - Contingency

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Division 00 & 01 Specification Sections, as well as the Special Conditions above, apply to this Section. Civil drawings and Architectural site plan and details, Technical Specifications, which relate to this Bid Category, include, but are not limited to the following sections:

03 30 00	Cast-In-Place Concrete
32 31 00	High-Security Cantilever Gates
32 31 19	High-Security Anti-Scale Fence

A) SITE CLEARING, EARTHWORK, SOIL STABILIZATION, EROSION CONTROL, SWPPP, AND SITE PLUMBING

Complete stabilization and place aggregate base for pavements immediately after excavating to subgrade. Bid Package 01 fully responsible for all cut and fill of earthwork on site and bringing building pad to rough grade.
The Contractor for Bid Package 02 – Shell will be responsible for excavation to floor slab subgrade and excavation for foundations, within a perimeter 5 feet outside the proposed building line. The exact line of this perimeter may be altered by mutual agreement among the Construction Manager, Site Work Contractor, and Building Shell Contractor with no adjustment to the Contract Sum. The Site Work contractor will have responsibility for all grading outside this perimeter, in addition to finish grading and construction of pavements and walk within this perimeter up to the building line -- after the building exterior has been completed and Construction Manager releases the area within the perimeter to the Site Work contractor.
The Site Work contractor shall provide temporary swales or relief ditches if so directed by Construction Manager to facilitate drainage within the building perimeter during construction, and shall backfill and restore such temporary swales to finish grade.
Site Work contractor shall perform final touchup site grading, seeding, including overseeding if deemed necessary by Construction Manager, and final cleanup and sweeping of site to achieve a clean and neat exterior.

1. Not Used.

2. Not Used.

3. Contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed.

4. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

5. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

6. This contractor shall include all traffic control measures necessary to perform, protect this work and to protect the public.

7. Construct temporary entrance drive per civil and architectural site drawings. Coordinate location with CM. Provide total of 6" of 3" minus stone at location of entrance drive for use during construction. Include all costs to maintain throughout construction and to install permanent roadway per schedule.

8. This Contractor is responsible for any import, export, cuts & fills, and lime stabilization to achieve final grades as per the contract documents.

9. Includes stripping and stock piling of topsoil. Coordinate location on site for stock piling with CM. Includes placement and spreading of topsoil to proper depths per contract documents to achieve final grades.

10**.** This contractor is responsible for furnishing, install and remove SWPPP elements per the contract documents. Assist the CM with required documentation, reporting and logs.

11. Furnish and install temporary seeding as required by the SWPPP at disturbed areas associated with this bid package.

12. Provide dirt subgrades and required compaction.

13. This Contractor shall be responsible for providing complete site plumbing system in compliance with all notes and specifications on the plans. Also included are all applicable details on the plans.

14. This Contractor shall include all excavation and backfill for the work of this Bid Package. Include complete granular backfill under, and adjacent to paved areas and curbing in accordance with Contract Documents.

15. This Contractor shall determine if the building rough grade is below the grade constructed outside the 5' line, creating a "ponding area", that will hold rainwater and will adversely affect the subgrade below the building. Adequate fill will need to be added by this Contractor to bring it to grade and allow for proper drainage away from building slabs.

16. This Contractor shall include grading or hauling of any excess materials disposed of or stockpiled on site as a result of the work of this bid package.

17. This Contractor shall be responsible for keeping surrounding streets clean from all mud and debris as a result of the work of this Bid Package. This Contractor shall provide street cleaning for mud and debris on surrounding streets resulting from erosion control measures not properly maintained.

18. This Contractor shall achieve all compaction requirements for backfilled areas in accordance with Contract Documents. Backfill to be placed in accordance with the Contract Documents.

19. Includes granular backfill or soil backfill at utility trenches and structures compacted per Contract Documents.

20. This Contractor is responsible for all cleanup associated with this work.

21. This Contractor to provide all safety measures, fencing, barricades, flagging, signage etc to protect areas of excavation associated with this bid package.

22. If Contractor intends to use excavated soil for backfill of utilities and finds that the soil is too wet to achieve compaction requirements, this Contractor shall be responsible for drying the intended backfill material or obtaining satisfactory backfill material in order to achieve proper compaction.

23. Includes backfilling of all structures and re-grading of disturbed areas to original condition.

24. Re-grade all trenched areas as required to restore areas to prior condition.

25. This Contractor shall coordinate the work of this Bid Package with other contractors performing adjacent/concurrent work so as to insure proper, timely and adequate interface.

26. Provide complete as-built drawings of all systems installed as part of this Bid Package. Drawings shall be kept up to date and available for inspection during the work.

27. Dewatering for this scope is the responsibility of this Contractor. Schedule must be maintained.

28. Provide all stripping, clearing, grubbing, siltation and erosion control per the construction documents.

29. Includes site clearing in accordance with the contract documents.

30. This Contractor is responsible for all site clearing, tree removal and demolition. Coordinate demolition with Utility Companies to verify disconnect of all utilities prior to starting work. Includes fill as necessary at areas of demolished items. All items to be completely removed and properly disposed of and in compliance with current local/state/federal codes and regulations.

31. Includes proper fill and compaction of such areas is included in this Bid Package. Includes removal of all existing slabs.

32. Includes stripping and stockpiling of topsoil in accordance with the contract documents. This Contractor shall haul and stockpile topsoil in a location on-site

determined by the Construction Manager. Stockpile adequate amounts for topsoil replacement at all areas disturbed by excavation and not covered by paving.

33. This Contractor shall be responsible for all spreading of topsoil and final grading of topsoil to finish elevations. Install topsoil to depths/thicknesses per Contract Documents.

34. Furnish, install, maintain and remove all erosion control and siltation control measures throughout the duration of this project. Includes all erosion and siltation control measures per plans and specifications, including but not limited to, protection around storm drain structures, area inlets, flared ends, and curb inlets. The General Conditions of the Stormwater Pollution Prevention Plan are the responsibility of this Contractor.

35. Erosion and siltation control work includes conforming with all local, state, and federal requirements associated with the Storm Water Pollution Prevention Plan (SWPPP). The SWPPP will be implemented and maintained (maintaining is by allowance – see allowance listed below) by this Contractor throughout the duration of the project. This Contractor shall be responsible for completion of the IEPA weekly inspection reports as required by the SWPPP and will submit them to the Construction Manager weekly.

36. Perform all mass site excavation, grading, cuts, fills and compaction in accordance with the Contract Documents. Tie in new grades with existing grades as shown.

37. This Contractor will be responsible for achieving the correct dirt subgrade elevations, within the specified tolerances at the building pads and paved areas.

38. Includes all required import or export of soils for entire site.

39. This contractor responsible for achieving the required compaction of building pad sub grade and paving subgrades.

40. Not Used.

41. Excavation per geo tech report.

42. Includes grading, plumbing and drainage swales along with other measures required to keep water from ponding on site and to allow site to drain during excavating and grading work.

43. This Contractor shall achieve finish grade elevations, within the specified tolerances.

44. Street entrance aprons to be excavated to dirt subgrade.

45 Furnish and install temporary seeding of all disturbed areas on the site as a result of this bid package, and Final Seeding.

46. This Contractor shall include all topsoil backfilling and grading at sidewalks, curbs, roads, shoulders, barriers, and parking lot edges after said areas are installed. Sequencing of this work to be coordinated with the Construction Manager.

47. Backfilling of pavement, paved areas, sidewalks, curbs, etc., includes touching up and re-grading adjacent areas to final grade after paved areas etc., are complete is by this contractor.

48.This Contractor shall be responsible for regrading dirt subgrades to ensure that the dirt subgrades are left at the correct elevations and grades, and within the specified tolerances.

49. The Contractor shall be responsible for providing the correct dirt subgrades, within the specified tolerances, at the asphalt paving areas. Review the pavement thickness and install dirt subgrades to accommodate the different asphalt paving thicknesses

50. Contractor shall be responsible for finish grading of asphalt paved areas, however, it is the responsibility of this Contractor to provide the dirt subgrades at the designed elevations and grades, and within the specified tolerances. The asphalt contractor's finish grading does not include re-grading to achieve design grades, elevations and tolerances. These are included in this Bid Package.

51. This Contractor shall restore all grades and adjacent work disturbed by the work of this Bid Package.

52. This Contractor must coordinate the installation of storm sewer around the building with the Structural/Roof contractor & other contractors. Storm sewer piping and structures near the building may need to be temporarily left out for crane access.

53. Regarding roof drain piping: This bid package contractor to bring storm sewer piping within 5 feet of the building for roof drains, stub up and cap above grade. Plumbing contractor will install interior piping and make tie-in at the 5 ft exterior location of stub up.

54. Furnish and install storm drain inlets as shown.

55. Includes compacted rock base at manholes and structures as shown.

56. This Contractor shall provide all labor, materials, tools and equipment to furnish and install all site concrete paving, sidewalks, walks with integral curbs, barrier curbs, turndown curb and sidewalk, curb and gutters, concrete swales at detention ponds and all other site concrete in accordance with the Contract Documents.

57. Includes all accessible ramps as shown and specified.

58. Includes ADA compliant detectable warning systems at ramps as shown and specified.

59. This contractor shall be responsible for all required excavation for site concrete and curb work. The Bid Package No. 1 Contractor shall leave the dirt at finish grade elevations at the site concrete areas. This contractor shall perform all required excavation to install the concrete sidewalks, curbing, and pavement including rock subbase at the designed final grades and elevations.

60. Includes tie-in of sidewalks to building at the locations shown and by methods indicated on typical details. Includes lean concrete frost blocks as indicated.

61. Includes all concrete curb, curb and gutters, sidewalks, elevated sidewalks and turndown curbs and concrete swales as shown.

62. Includes removal and disposal of excess rock in backfill areas along concrete paving to allow for proper soil backfill by others.

63. Includes installation of concrete paving, concrete drives and concrete entrances. Make smooth, clean and neat tie-ins to all adjacent surfaces.

64. Includes all forms, reinforcing mesh, rebar, joint sealants and expansion joints in accordance with Contract Documents.

65. Includes pavement joint layout as shown. Maintain concrete paving joint layouts and patterns.

66. Includes furnishing, installing, and compacting aggregate base at concrete paving, curbs, sidewalks and other site concrete per the Contract Documents.

67. This contractor to remove and replace existing signs for installation of sidewalks as indicated.

68. Furnish and install all pipe bollards. Review all Civil, Architectural, Structural and MEP/FP drawings to quantify all pipe bollards.

69. Includes tie-in to storm drainage structures as required.

70. Includes all concrete required for dumpster pad and generator pad.

71. Includes furnishing and installing joint sealant as required.

72. Light pole bases are by the Electrical contractor.

B) ASPHALT PAVING / CONCRETE CURB-GUTTER / CONCRETE WALKS / SITE FENCING

1. This contractor responsible for all asphalt paving, concrete curbs, gutters, concrete walks, site fencing.

2. Not Used.

3. This contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed.

4. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

6. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

7. This contractor shall include all traffic control measures necessary to perform, protect this work and to protect the public.

8. Furnish and install complete concrete, asphalt paving and rock subbase in accordance with the Contract Documents.

9. This Contractor to include a minimum of 2 mobilizations.

10. Includes all pavement markings, painting and striping in accordance with the Contract Documents, including arrows, text, and parking blocks. Include markings on asphalt, concrete pavement, and/or gravel.

11. Includes free standing site signage, posts, anchoring etc – i.e. stop signs, handicap signs, no parking sign, turn lane signs all furnished and installed per contract documents.

12. Aggregate base course and asphalt paving to be provided in the thicknesses and types as shown and specified.

13. This Bid Package includes all fine grading, proof rolling and miscellaneous grading required ensuring dirt subgrade is properly prepared for rock subbase and asphalt installation.

14. Contractor shall verify that existing subsurface is ready for asphalt installation and adequate to support pavement as specified.

15. Includes all handwork required for complete and proper installation.

16. Furnish and install parking blocks as shown, either on concrete or asphalt.

17. Furnish and install accessibility and crosswalk signs as indicated.

18. Contractor shall be responsible for installing the work of this Bid Package in conformance with the technical specification sections and all notes and specifications on the plans.

19. This Contractor is responsible for cleanup associated with this work.

20/21. Not Used.

22. This Contractor to include in their bid the following:

1. Include in Base Bid amount to dress up &/or regrade rock base disturbed by other trades during construction for use as temporary access.

BID PACKAGE NO. 02 – BUILDING SHELL
Includes Allowance 1 – Roof Sheathing
Includes Allowance 3 - Contingency

All Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Division 00 and 01 Specification Sections, as well as the Special Conditions above, apply to this Section. Technical Specifications, which relate to this Bid Category, include, but are not limited to the following sections:

02 41 13	Selective Demolition
03 30 00	Cast-In-Place Concrete
04 20 00	Unit Masonry
04 22 00	Concrete Unit Masonry
04 26 13	Masonry Veneer
05 12 23	Structural Steel
05 31 00	Steel Deck
05 40 00	Cold-Formed Steel Framing (CFSF) System
05 50 00	Metal Fabrications
06 10 00	Rough Carpentry
06 10 53	Miscellaneous Rough Carpentry
06 16 00	Sheathing
06 17 53	Metal Plate Connected Wood Trusses
07 01 50	Preparation for Re-Roofing
07 21 00	Thermal Insulation
07 21 19	Foamed-In-Place Insulation
07 41 13.16	Standing Seam Metal Roof Panels
07 42 13.23	Metal Composite Material Wall Panels
07 42 93	Soffit Panels
07 54 23	Thermoplastic-Polyolefin (TPO) Roofing
07 62 00	Sheet Metal Flashing and Trim
07 71 00	Roof Specialties
07 72 00	Roof Accessories
07 72 53	Snow Guards
07 92 00	Joint Sealants

A) CONCRETE WORK
Contractor for Bid Package 02 has complete responsibility for construction of the building foundations and floor slab. Place aggregate base immediately after stripping and excavating to subgrade, to minimize exposure of the subgrade to weather. Ensure drainage of excavations and subgrade during construction; provide pumping as needed for this purpose and coordinate with Site Work contractor through the Construction Manager.

1. This bid package includes scope of work in the New Police Station Building and in the Renovation of existing Village Hall.

2. This contractor includes structure and roofing scope at entrance canopy.

3. Not Used.

4. This contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed.

5. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

6. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

7. Provide all layout required for this package, beyond the scope of work as outlined in contract documents. The Owner will provide control lines and elevation benchmarks one time only. If additional layout is required, this contractor will be responsible for payment of said services.

8. This contractor shall perform the work in areas and sequences as required by the Construction Manager. This Contractor shall be required to provide equipment and manpower to work in multiple locations simultaneously and in areas and sequences as required by the project schedule and Construction Manager.

9. This contractor shall include all traffic control measures necessary to perform, protect this work and to protect the public.

10. This Contractor shall be responsible for its own temporary power requirements to complete the work of this Bid Package.

11. This Contractor is responsible for a wash out pit in one location on site as directed by the Construction Manager. All concrete wash out is to be deposited in this one location. Includes removal, disposal and re-grading of wash out pit to original condition at completion of this scope of work.

12. Excavated spoils resulting from the work of this Bid Package shall be loaded, hauled and removed from site by this Contractor.

13. This Contractor shall be responsible for all clean-up relating to the work of this Bid Package.

14. This Contractor shall provide clean-up for this work, including broom clean areas, and dispose of all debris daily into dumpsters or trucks provided by this Contractor.

15. All testing will be performed by a third-party testing facility to meet all noted specifications.

16. This Contractor shall be responsible for keeping adjacent streets clean from mud and debris resulting from the work of this Bid Package.

17. Repair or replace erosion control measures damaged or moved by the work of this Bid Package.

18. This contractor to include all dewatering of open excavations necessary to proceed with the work of this Bid Package.

19. This contractor to close up and/or barricade off all excavations left open overnight.

20. This bid package to install a complete foundation system including grade beams, pier pads, lean concrete, foundation walls and all structural concrete for the entire building.

21. Provide all layout, handwork, excavation, backfill and compaction, concrete forming, concrete, steel reinforcement, reinforcement accessories, curing materials, expansion joints, perimeter foundation insulation, labor to set embedment's and anchor bolts and all other components necessary to complete the concrete foundation system as indicated on the plans and specifications.

22. Elevator pit, sump pit, and pump pit excavation, foundations, foundation walls, waterproofing and backfill is by this contractor.

23. All foundation insulation is by this contractor.

24. This contractor will be required to install a grounding conductor, ground ties to the rebar in the grade beam to be accessed by the electrical contractor at a later stage in construction and fully coordinated with Electrical Bid Package.

25. Provide excavation and spoil removal associated with footing/foundation system. Building pad will be at subgrade.

26. Foundation backfill is by this contractor.

27. Provide grouting of all steel column base plates.

28. Include all necessary labor and material to clean the top of grade beam, footing/foundation from mud, debris, and water prior to steel erection and grouting base plates.

29. Include all necessary labor to layout and place all steel embeds and anchor bolts in concrete. Anchor bolts and embeds provided by structural steel contractor. This Contractor to receive, inventory, unload, store, distribute, and install all embeds and anchor bolts provided by others. Anchor bolt installation tolerance shall be ± 1/8" in any direction.

32. Furnish and install all reinforcing steel for concrete foundations and vertical dowels incorporated into foundation as required.

33. Provide all layout, handwork, vapor barrier, perimeter insulation, wire mesh, reinforcing steel, compacted rock subgrade, concrete forms, concrete, expansion joints, control and construction joints, saw cutting, sealants, finishing, curing, protection, and all other required components for the complete installation of all interior slabs on grade, elevated slabs, and stair pans, treads and landings as indicated in the Contract Documents.

34. Install sleeves for gymnasium equipment. Sleeves provided by others. Coordinate with equipment supplier the layout for all sleeves.

35. Includes all necessary material and labor to box-out around column anchor bolt locations and pour and finish concrete infills at columns once steel is erected.

36. Furnish and install cure and seal to floor slab. Coordinate compatibility with finished flooring and floor sealers.

37. Includes install caps or other approved safety covers on all exposed rebar.

38. Furnish and install all rebar, reinforcing, wire mesh and supports for concrete flatwork.

39. The finish grade of the building pad shall be within 1/10 of a foot of proposed dirt subgrade. This Contractor shall be responsible for reshaping the dirt subgrade at all areas prior to placing rock or concrete.

40. This contractor to layout and provide thickened slabs as indicated in the construction documents.

41. Installation of slabs on grade to be coordinated with the schedule and Construction Manager

42. Includes all required saw cutting of flatwork and installation of joint sealants/caulking per contract documents.

43. This contractor shall be responsible for conforming to all typical details shown on the plans.

44. This bid package includes all specifications and notes on the plans in addition to the specification manual.

45. This Contractor understands that floor slabs will contain plumbing and electrical stub-ups and rough ins and shall take precautions to protect previously installed work from damage due to concrete work. If damage occurs during installation of concrete work, it is the responsibility of the contractor to notify the Construction Manager. Cost of repairs will be by the damaging contractor.

46. It is the sole responsibility of this contractor to maintain specified floor slopes. Coordination between trades required.

47. Conform to all specified tolerances in accordance with Contract Documents.

B) MASONRY WORK

1. Furnish and install all masonry work for the building, interior and exterior.

2. Not Used

3. Not Used

4. This contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed. 6. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

5. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

6. All construction traffic to utilize the parking/laydown areas.

7. This contractor shall include all traffic control measures necessary to perform, protect this work and to protect the public.

8. Furnish and install all concrete masonry units, veneer, cavity wall insulation, mortar, masonry joint reinforcement, ties and anchors, reinforcing steel, embedded metal flashing, compressible fillers, wicks, cavity drainage, temporary wind bracing and cold weather protection to provide a complete exterior masonry system, structural masonry and interior masonry in accordance with the plans and specifications.

9. Furnish and install all cast stone sills, cast stone capes, thru-wall flashing and weeps.

11. Provide all washing and cleaning of masonry. Includes all temporary protection of masonry work.

12. Provide all miscellaneous masonry accessories.

13. Provide all masonry expansion joints as required and/or indicated on the drawings.

14. Provide necessary labor and material to patch masonry around all wall penetrations.

15. Provide and install all rigid board cavity insulation, thermal and air barrier wall system at masonry walls where indicated. It is the intent that this contractor installs the fluid applied moisture/air barrier and rigid cavity insulation that attaches to masonry and will provide and install where it attaches to metal stud framing, regardless of exterior material finish.

16. Furnish and install all block, cast stone cap, flashing, sealants, reinforcing, grout, pins, etc at dumpster enclosure and monument sign.

17. Includes CMU bases in locker rooms.

18. This contractor to ensure top of wall bracing indicated on the structural drawings is completed. This contractor to set embedded items provided by others. Structural steel contractor to furnish and weld.

19. All lintels furnished by Contractor.

20. Provide mock-ups as indicated to demonstrate full-size qualities of materials, workmanship, and aesthetic effects. The on-site location for the mock-up panels shall be as directed by the Construction Manager.

21. Install all sleeves, embeds, and shelf angles furnished by others.

22. This contractor to furnish, drill and epoxy all dowels into foundations as required for this work.

23. Provide caulking of all masonry joints, masonry to steel joints, and at all locations where masonry abuts other material. This includes any backer rod, fire safing, etc.

24. Provide all required scaffolding and planking and other means to access the work to be performed in this Bid Category.

25. Furnish and install all temporary bracing of masonry construction in accordance with OSHA and the Masonry Institute of America.

26. The plumbing contractor shall provide access to temporary water supply and hose bib. It is this Contractor’s responsibility to furnish necessary hoses.

27. It is this Contractor’s responsibility to verify masonry quantities.

28. This Contractor shall provide clean-up for this work, including broom clean areas, and dispose of all debris daily into dumpsters or trucks provided by this Contractor.

29. Once scaffolding system is removed from an area, remove all masonry debris from grade and redress grades to their original elevation and condition. Includes all temporary roads, grades and building structures affected by mortar mixers, lulls, scaffolding and any other masonry equipment.

30. Include labor and material to patch masonry around all mechanical, electrical, plumbing and fire protection items.

31. Grout all hollow metal frames adjacent to masonry.

32. This contractor understands that sequencing of steel erection and other trades will dictate work areas. Areas of the building will need to be left out for access.

33. This contractor is responsible for daily protection of its walls to prevent rain or any water from entering the wall system.

34. The masonry contractor shall provide all layout for this work. Includes layout for wall openings, penetrations, and coordination of other trades.

35. Provide all grouting of block in accordance with the construction documents.

36. Install all anchor bolts, embeds, etc. provided by others, but integral to a complete structural system.

37. Coordinate all openings for windows and doors with Bid Package 03 Interior and Construction Manager.

38. Provide all wall insulation shown on details.

C) STRUCTURAL STEEL & MISCELLANEOUS STEEL & WOOD TRUSSES

1. Not Used.

2. Not Used.

3. Not Used.

4. This contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed.

5. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

6. The contractor is responsible for obtaining a third-party testing facility to provide welding inspections where required by specifications and local code enforcement.

7. In addition to 2D shop drawings, the Contractor will provide 3D shop drawings for review and coordination with other contractors. These 3D shop drawings will be provided at the time of 2D shop drawing submittal and again after review and finalization of fabrication drawings. 3D shop drawing shall be provided in the .dwg / AutoCAD format, this file can be exported from native authoring software programs. 3D shop drawings shall include: All primary steel members (columns, beam, joists, and trusses) and secondary steel members (brace frames, X-bracing, support angels, lintels, gusset plates, braces, kickers, connections). Items will be modeled to fabrication size.

8. This contractor shall include all traffic control measures necessary to perform, protect this work and to protect the public.

9. This bid package includes all labor, material, tools and equipment to furnish and install all wood trusses, structural steel columns, beams, joists, girders, metal roof deck, all connections, shelf angles, edge angles, structural bracing, nelson studs, steel plates, bent steel plates, angles, channels, angle braces and

kickers, gussets, base plates, tube steel, anchor bolts, connection bolts and all other accessories and components for a complete steel package in accordance with the Contract Documents.

10. The intent is that the Contractor for this bid package provides and installs a complete wood truss, steel, joist and deck package as shown and specified.

11. This Contractor shall comply with all specified requirements. Conform to all quality assurance requirements except testing. The testing agency shall be engaged by the Owner.

12. This Contractor shall expedite the shop drawings upon award of the contract. This Contractor shall submit shop drawings in the sequence and for the areas required by the project schedule and as coordinated with the Construction Manager.

13. This Contractor shall be prepared to provide sufficient manpower, equipment, and material to erect structural steel systems in multiple areas simultaneously as required by the project schedule and coordinated with the Construction Manager. The Contractor agrees to erect steel in more than one building area at the same time as dictated by the schedule.

14. Provide anchor bolts, embeds, loose steel bearing/leveling plates, loose angles and lintels, shelf angles, templates, setting diagrams, and layout drawings for installation and coordination by other trades.

15. Verify on-site, the installation of the anchor bolts and embeds four weeks prior to the start of steel erection.

16. This Contractor is responsible for the safe delivery, storage and protection of materials on-site as related to this bid package.

17. Provide all required layout for the work of this bid package. This Contractor shall take all necessary field measurements to verify the fit of this work to that of other contractors prior to the start of field erection.

18. Provide shop primer on steel per Contract Documents.

19. Coordinate the work of this contract with the work of other trades performing adjacent work.

20. Not Used

21. This Contractor shall ensure that any metal deck that is temporarily installed overnight or on weekends is properly fastened down to the frame so that is will not blow off the building. Loose panels of metal decking shall not be left overnight or over a weekend without being fastened down.

22. This Contractor shall provide all web shear plates and stiffeners for beams, columns or joists that are required but not specifically shown.

23. All remedial work associated with failed test results, inspections, incorrect layout, and mis fabrication shall be the responsibility of this Contractor including the cost of retesting.

24. The metal deck, structural steel, and joists must be free from oil, dirt and debris resulting from fabrication or installation and ready to accept finish paint where paint is scheduled. Cleaning of steel, deck and joists of mud, oil and debris resulting from fabrication, storage or erection is the responsibility of this Contractor.

25. Provide all required generators and welders required for this work. This Contractor shall be responsible for its own temporary power requirements.

26. Contractor to review the preliminary project schedule and understand and comply with the general sequencing and phasing of the project.

27. Furnish and install all roof ladders, both interior and exterior.

28. Furnish and install 3rd party engineered wood trusses.

29. Furnish and install all metal handrails and guardrails.

30. Furnish and install purlins as indicated and provide means for stuffing with spray foam as indicated in typical details.

31. This Contractor shall furnish and install all required safety cables/railings at edges, perimeters and openings as required.

32. This Contractor shall be responsible for all clean-up of rubbish and debris associated with the work of this bid package. All debris and rubbish to be placed by this Contractor in dumpsters trucks provided by this Contractor

33. This contractor to furnish and install the steel dumpster gates. The concrete contractor will set the bollards. This contractor to furnish and install the hinge sleeves and gates.

34. Contractor to review load information for mechanical units, athletic equipment and other structure mounted systems and provide shop drawings and structural components accordingly.

35. Furnish and install all diagonal braces and connections as indicated.

36. Contractor shall be responsible for all typical details shown on the plans.

37. Furnish and install support angles and plates at top of metal stud and masonry walls per bracing details. Coordinate installation of these angles with the appropriate contractor.

38. Includes all required joists web reinforcing angles per typical details.

39. Furnish and install steel channels.

40. This bid package includes all structural steel components indicated within the Village Hall renovation scope.

41. Furnish and install tube steel.

42. All miscellaneous steel not listed in other locations.

43. This contractor shall provide the all decking per the contract documents.

44. Furnish all steel lintels. Lintels welded to framing are to be installed by this Contractor. All loose lintels to be installed by Masonry Contractor.

45. Furnish and install suspended “T” for operable partitions. Includes angle framing.

46. Furnish and install support steel needed for partial height walls, as indicated.

47. This contractor to provide necessary temporary bracing and shoring as required.

48. Includes structural thermal breaks as indicated

D) METAL PANELS / SHEET METAL / METAL ROOFING

1. Not Used.

2. Not Used.

3. Not Used.

4. This contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed.

5. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

6. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

7. Review phasing/sequencing plan and schedule at the end of this section to understand that the work will not take place at one time but sequenced as indicated. Submittals relating to IMWP to proceed immediately as wall panels provide weather barrier to enclose building.

8. Furnish and install all metal wall panels complete including but not limited to: installation accessories, anchoring, furring, rigid insulation behind panels if shown, all sub girts, Z-girts, flashings and counter flashings, trim components, clips and all necessary components for a complete wall system.

9. Furnish and install all metal soffits, fascia, gutters, downspouts, scuppers per the contract documents. Includes but not limited to furring, sub girts, flashings, trim components, installation accessories.

10. Furnish and install downspouts and make tie-in to underground drainage coordinated with Bid Package No. 1 Contractor.

11. Furnish and install all sheet metal components complete per contract documents and manufacturer recommendations. Including but not limited to: roof drainage sheet metal components, expansion joints with cover plates, flashings, counter flashings, step flashings, drip edge, IMWP base flashing, and hat channel. For New Police Station and existing Village Hall.

12. Furnish and install all interior and exterior caulking associated with this scope of work for a complete sealed system.

13. Furnish and install standing seam metal roofing complete per contract documents. Includes but not limited to panels, panel sealants, roof felt, underlayment materials and accessories, flashings and trim, roof penetration flashings. Remove temporary protective coatings.

14. Provide Phasing plan for approval on Village Hall roofing removal and replacement before commencing with work.

15. Furnish and install the decorative formed metals per the contract documents.

16. This contractor to participate in pre installation meetings for this bid package related to wall panel, roof panel, soffits, trim and accessories installation.

17. Furnish all layout for this bid package.

18. This Contractor to coordinate with the metal stud contractor layout of studs for wall panel installation.

19. This Contractor shall be responsible for all clean-up of rubbish and debris resulting from the work of this bid package.

20. All rubbish and debris generated by this contractor shall be placed in dumpsters or trucks provided by this Contractor.

21. Provide metal roof panel assemblies that comply with specifications.

BID PACKAGE NO 03 – INTERIOR
Includes Allowance 2 – Building Plaque
Includes Allowance 3 – Contingency
Includes Allowance 5 – Dimensional Letter Signage

All Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Division 00 and 01 Specification Sections, as well as the Special Conditions above, apply to this Section. Technical Specifications, which relate to this Bid Category, include, but are not limited to the following sections:

02 41 13	Selective Demolition
03 30 00	Cast-In-Place Concrete
06 41 16	Plastic-Laminate-Faced Architectural Cabinets
07 21 00	Thermal Insulation
07 21 19	Foamed-In-Place Insulation
07 92 00	Joint Sealants
08 11 13	Hollow Metal Doors and Frames
08 14 16	Flush Wood Doors
08 31 13	Access Doors and Fames
08 31 13.53	Security Access Door and Frames
08 33 23	Overhead Coiling Doors
08 34 20	Power Four-Fold Doors
08 34 63	Detention Doors and Frames
08 36 13	Sectional Doors
08 41 13	Aluminum-Framed Entrances and Storefronts
08 56 19	Pass-Through Windows
08 56 53	Security Windows
08 71 00	Door Hardware
08 71 13	Automatic Door Operators
08 71 63	Detention Door Hardware
08 80 00	Glazing
08 83 00	Mirrors
08 88 53	Security Glazing
08 91 19	Fixed Louvers
09 22 16	Non-Structural Metal Framing
09 29 00	Gypsum Board
09 30 00	Tiling
09 51 13	Acoustical Panel Ceilings
09 65 13	Resilient Base and Accessories
09 65 19	Luxury Vinyl Tile Flooring
09 65 66	Resilient Athletic Flooring
09 67 00	Fluid-Applied Flooring
09 68 13	Tile Carpeting
09 91 13	Exterior Painting
09 91 23	Interior Painting
10 11 16	Fixed Marker Boards

10 14 16	Plaques
10 14 19	Dimensional Letter Signage
10 14 23	Panel Signage
10 28 00	Toilet, Bath, and Laundry Accessories
10 28 13.63	Detention Accessories
10 44 13	Fire Extinguisher Cabinets
10 44 16	Fire Extinguishers
10 51 13	Welded Metal Lockers
12 24 13	Roller Window Shades
12 36 61.16	Solid Surfacing Countertops
12 55 00	Detention Furniture

A) GENERAL TRADES

Contractor for Bid Package 3 will be responsible for final cleaning of building interior and exterior, excluding the surrounding site.

1. Contractor to fully coordinate all needed information with Bid Package 02 contractor and responsible for all openings, connections, congruent work, related work, etc.

2. This bid package includes scope of work in the New Police Station Building and in the Renovation of existing Village Hall.

3. Not Used.

4. This contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed.

5. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

6. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

7. Provide all layout required for this package, beyond the scope of work as outlined in contract documents. The Owner will provide control lines and elevation benchmarks one time only. If additional layout is required, this contractor will be responsible for payment of said services.

8. All construction traffic to utilize the parking/laydown areas. This contractor shall include all traffic control measures necessary to perform, protect this work and to protect the public.

9. Not Used

10. Furnish and install all wood blocking and nailers required to complete the installation of all items included in this Bid Category in accordance with the construction documents. Include all wood blocking for lockers.

11. Furnish and install all wood blocking and nailers related to the installation of telephone boards, MEP items, and all other new building items i.e. windows, aluminum doors etc.

12. Furnish and install steel brackets, supports, angles, etc. for casework.

13. Furnish and install all blocking as required by the manufactured and custom casework. Provide all blocking for casework whether furnished with this Bid Package or furnished by others.

14. Provide wood blocking required for roof access ladders, window treatment, fascias, soffits, all roof blocking. This Contractor is responsible for any and all interior and exterior wood blocking.

15. Furnish and install all interior signage and plaques. This includes wayfinding signage as currently indicated on the drawings.

16. Furnish and install building sign and lettering as specified.

17. Furnish and install all manufactured casework, custom casework, millwork, fasteners, caulking, countertops, hardware, trim, accessories, and all other building components necessary to provide a complete and total casework and millwork system in accordance with the construction documents. Lockers by others.

18. Furnish and install all fire extinguisher cabinets, including extinguishers in accordance with the construction documents.

19. Furnish and install all windows, doors, and storefront systems (Interior and Exterior). Provide all necessary bracing to keep the door frame from buckling or warping. Coordinate all exterior openings with Bid Package 02.

20. Furnish and install all toilet compartments in accordance with the construction documents, including any and all wood or steel supports, bracing and anchoring.

21. Includes all door hardware and automatic operators.

22. Furnish and install all toilet accessories in accordance with the construction documents. Furnish and deliver hand dryers to Electrical Contractor for installation.

23. Include installation of owner provided toilet accessories as indicated.

24. Coordinate layout with the mason and drywall contractors to ensure proper rough opening dimensions.

25. Provide all layout work in this package.

26. Provide all interior and exterior wall layout for metal stud and masonry partitions. Includes door and window openings.

27. Provide and install all interior windowsills.

28. Furnish and install all smoke, fire safing and fire caulking of components included in this work to develop the fire integrity of the building.

29. Furnish and install all borrow light frames.

30. Provide all caulking work for all items included in this package.

31. Provide all interior and exterior caulking work for hollow metal, storefront, and/or stainless-steel door frames & borrow light frames.

32. Caulk all hollow metal, storefront, stainless steel to drywall and masonry joints.

33. Caulk all windowsills.

34. Furnish and install all necessary backer rod and rigid insulation to provide a complete sealant system in all areas.

35. Furnish and install any and all access panels required for this bid package. Coordinate all needed panels with all Bid Package contractors.

36. Furnish and install all hollow metal, fiberglass and stainless-steel doors, frames, wood doors, and door hardware.

37. This contractor to furnish all door hardware including hardware for aluminum door system. This contractor to distribute aluminum door hardware for installation. Auto door operators are to be provided by this contractor.

38. Furnish and install corner guards as indicated.

39. Furnish and install the prefabricated aluminum canopies as indicated on the drawings. Includes all hanging/mounting hardware and supports required for installation.

40. Furnish and install 1 Knox box as location directed by construction manager and coordinated with Bid Package 02.

41. Furnish and install all Detention equipment, Detention frames/doors, and Detention accessories.

42. Not used.

43. Furnish and install any and all wood blocking at roof scuppers, roof expansion joints and lockers.

44. All wood blocking required for project is by this contractor.

45. Coating the backside of hollow metal frames as required by the contract documents is by this contractor. See door schedule notes and project specifications.

46. Not Used

47. Furnish and install interior doors, door hardware, windows.

48. Not Used

49. Contractor to use anti-compression sleeves as indicated, and per IMWP manufacturer recommendations, when attaching to Insulated Metal Wall Panels.

50. This Contractor is responsible for caulking installed items under this scope if the items if the last finished product to be installed prior to or after painting.

51. Provide all clean-up for items included with this bid package. All areas are to be kept clean on a daily basis and all debris is to be deposited in a dumpster or trucks provided by this Contractor.

B) WINDOWS / GLASS & GLAZING / DOORS & FRAMES

1. Contractor to fully coordinate all needed information with Bid Package 02 contractor and responsible for all openings, connections, congruent work, related work, etc.

2. Furnish and Install all windows, storefronts, doors, frames, hardware for entire project.

3. Not Used.

4. This contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed.

5. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

6. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

7. Furnish and install all doors, windows, and door hardware.

8. Furnish and install aluminum framed entrances, storefronts, curtain walls, windows, glass and glazing.

9. Includes all shims, leveling channels, sub sills, steel reinforcement and steel supporting members to ensure a complete aluminum window and entrance system.

10. Furnish and install all interior and exterior caulking of aluminum frames as indicated.

11. Furnish and install batt insulation around all aluminum frames to eliminate voids between aluminum frame and framed openings to prevent air infiltration.

12. Insulation and metal trim is by this contractor.

13. Contractor to furnish all door hardware including hardware for aluminum door system. Contractor to distribute aluminum door hardware for installation. Auto Door operators are to be provided by this Contractor.

14. Not used.

15. Furnish and install all exterior glass and glazing per the contract documents.

16. Furnish and install all spandrel panels per contract document.

17. Not Used.

18. Includes all necessary trim for a complete and finished aluminum frame system.

19. Provide all clean-up for items included with this bid package. All areas are to be kept clean on a daily basis and all debris is to be deposited in a dumpster or trucks provided by this Contractor.

C) METAL STUDS / DRYWALL / ACOUSTICAL CEILINGS / INSULATION

1. Not Used.

2. Not Used.

3. Not Used.

4. This contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed.

5. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

6. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

7. This contractor shall include all traffic control measures necessary to perform, protect this work and to protect the public.

8. Not used

9. Furnish and install all interior metal studs, clips, bracing, layout, gypsum board, shaft wall assemblies, interior wall and ceiling expansion joints, control joints, seismic reinforcing, vapor barrier, sound batts, insulation, firestopping, taping, finishing, anchors, plaster, caulking, metal trims and all other components required for a complete interior partition and ceiling system in accordance with the construction documents and compatible with all other building components. Includes acoustical sealant as indicated on partition types between partitions and roof deck, sound walls sealed at top and
bottom. Includes all general partitions notes indicated on drawings.

10. Furnish and install all acoustical ceiling grid, pad, splay wires, layout, structural supports, egg-crate lens, expansion joints, seismic reinforcing, caulking, sound attenuation blankets and all other components required for a complete and total acoustical ceiling system in accordance with the construction documents and compatible with all other building components.

11. Furnish and install all sound attenuation, interior thermal insulation, anchors and all other components required for a complete and total system in accordance with the construction documents and compatible with all other building components.

12. Furnish and install all caulking of adjacent drywall and acoustical surfaces. Where drywall interfaces with masonry, the drywall contractor will be responsible for caulking.

13. Furnish and install all required smoke, fire-safing and fire caulking to develop the fire integrity of the building components included in this work.

14. Furnish and install thermal and spray foam insulation as indicated, including inside of purlins.

15. This Contractor to provide layout of work in this package including, but not limited to acoustical ceilings, interior and exterior door opening framing, soffit/bulkhead framing and interior and exterior window opening framing as required. Wall layout by this Contractor.

16. Install all required access panels, furnished by others, in building components included in this scope of work.

17. Provide miscellaneous and incidental blocking for items in this Bid Package.

18. Furnish and install all insulation for all items with this package including, but not limited to all insulation at trusses, eaves, soffits, interior walls, etc.

19. Furnish and install all steel stud kickers for all miscellaneous steel.

20. Temporary lighting will be available per the construction documents; any additional lighting required for this work would be this Contractor's responsibility.

21. Coordinate the installation of all acoustical ceiling mounted fixtures with respective trades.

22. Includes all wall, floor and roof sleeves as required for work included in this Bid Package; as well as appropriate fire safing at fire rated walls and floors and acoustic safing at all non-rated sleeved/openings locations.

23. Furnish and install all channels, and miscellaneous components for framing system.

24. Furnish and install all foam insulation, and compressible filler insulation at metal stud partitions and or framing components.

25. Furnish and install thermal and air barrier wall system to metal stud framing systems per contract documents.

26. Includes sub framing required for formed metal wall panel system to comply with thermal and air barrier wall system specification. This contractor to coordinate wall framing with IMWP contractor.

27. Furnish and install grout in all hollow metal frames located in metal stud partitions per contract documents. See hollow metal frame details. Grouting of frames in masonry openings is by the masonry contractor.

28. This contractor responsible to furnish and install: fire safing insulation, sheet metal as indicated, type- X gypsum, batt insulation and metal track shown on partition details.

29. Furnish and install structural bracing in metal stud walls per contract documents.

30. Furnish and install interior metal stud partitions complete including metal framing, headers, insulation, bridging, structural and seismic bracing, sealants, fire stopping/safing. Includes bracing and slip track details as indicated.

31. Includes all wall, floor and roof sleeves as required for work included in this Bid Package; as well as appropriate fire safing at rated walls and floors and acoustic safing at all non-rated sleeved/opening locations. Coordinate all needed sleeves through walls or ceilings with all bid package contractors.

32. Furnish and install all caulking and sealant of work associated with this bid package when abutting other finish work to provide a complete finished and sealed system.

33. Prior to installation of ceiling grid and/or ceiling framing, coordinate with all trades the layout of above ceiling items to avoid interference and to confirm location of all ceiling items. Review all drawings including MEP and FP. Includes layout necessary for mechanical ceiling cassettes.

34. Set metal stud runners in two (2) continuous beads of sealant per partition details.

35. All cold formed metal framing, as indicated under division 054000, shall have shop drawings designed by a licensed Structural Engineer registered in the State of Illinois. This is primarily exterior wall framing but could include some limited interior framing that exceeds height or span limitations of the Division 09 non-structural framing or gyp assembly spec sections.

36. Not Used

37. Provide all clean-up for items included with this bid package. All areas are to be kept clean on a daily basis and all debris is to be deposited in a dumpster or trucks provided by this Contractor.

D) FLOORING – RESILIENT, CARPET, CERAMIC TILE, LVT, FLUID APPLIED, RESILIENT BASE

1. Not Used.

2. Not Used.

3. Not Used.

4. This contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed

5. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

6. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

7. This contractor shall include all traffic control measures necessary to perform, protect this work and to protect the public.

8. Furnish and install all resilient tile floor, resilient sheet flooring, carpet, vinyl base and ceramic tile along with all other components necessary to provide a

complete flooring and ceramic tile system compatible with all other building elements in accordance with the construction documents. Includes floor markings associated with this work.

9. Provide all floor prep and minor floor patching as required. Proceeding with your work in an area constitutes acceptance of the surfaces to be covered in flooring.

10. Provide all final broom clean prior to installation of materials and utilize a “clean sweep” floor product to final sweep. All imperfections in substrate must be brought to the attention of the Construction Manager prior to commencing work. If work is started without notification to Construction Manager, all imperfections will be remedied by this Contractor.

11. This Contractor shall scrape out all saw joints of debris and patch in accordance with the construction documents.

12. This Contractor shall make preliminary trips to the jobsite within fourteen (14) days of the concrete slab installations to check the floor for levelness and provide a report and marking of areas for correction within seven (7) days thereafter.

13. The temporary lighting will be in conformance of the construction documents and provided by the Electrical contractor. Any lighting required beyond the electrical scope required to complete this work shall be this Contractor’s responsibility.

14. Provide all lay out associated with this work.

15. Furnish and install tactile rubber surface materials.

16. Not Used

17. Furnish and install all ceramic tile, trim units, extra stock, sealants, and all other components necessary to provide a complete tile system compatible with all other building elements in accordance with the construction documents.

18. Review all drawings & verify all pattern layout prior to starting work for this bid package.

19. This Contractor shall include in the base bid a moisture mitigation system for their work such that the concrete moisture content is above the manufacturer’s recommendations for installation. The mitigation product shall be compatible and approved by the flooring manufacturer in order to maintain the product warranty. Contractor to assume 99% relative humidity and include any necessary labor, material, and equipment for a complete moisture mitigation system.

20. Provide all clean-up for items included with this bid package. All areas are to be kept clean on a daily basis and all debris is to be deposited in a dumpster or trucks provided by this Contractor.

E) PAINTING / COATINGS

1. Not Used.

2. Not Used.

3. Not Used.

4. This contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed.

5. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

6. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

7. This contractor shall include all traffic control measures necessary to perform, protect this work and to protect the public.

8. Furnish and install all interior and exterior painting and coatings in accordance with the construction documents. Pavement markings are by the Bid Package 02 Contractor.

9. Provide surface preparations as required. Proceeding with your work in an area constitutes acceptance of the surfaces to be painted. Notify the Construction Manager in writing of any areas or surfaces, which are unacceptable. Minor paint touch-up of walls, door frames, doors, etc. is assumed to be part of this contract.

10. Provide all layout required to complete the work of this bid package.

11. This Contractor shall coordinate the work of this contract with the work of other trades performing adjacent concurrent work so as to ensure proper, timely, adequate interface including but not limited to; carpentry, masonry, flooring, acoustical, gypsum, and mechanical/electrical work.

12. Provide painting of electrical work, fire protection system, plumbing and mechanical equipment and systems as indicated in the contract documents. Paint exposed wood framing, structural steel, miscellaneous metal, exterior gas piping, mechanical and electrical work in finished are- as in accordance with the construction documents.

13. Furnish and install Concrete Floor Sealer on exposed concrete floors per Contract Documents. Properly clean, sand, remove stains before applying floor

sealer all in accordance with manufacturers requirements. Verify with concrete contractor his cure & seal is compatible with painter's floor sealer.

14. For surfaces to be painted, any accessory or equipment including, but not limited to, thermostats, hardware, wall switch and outlet covers, visual display boards, etc. provide finish painting prior to the installation of these items or this contractor shall remove and reinstall as required or provide adequate protection.

15. This Contractor shall be responsible for the complete masking of all work of others. See fire sprinkler bid package for coordination of sprinkler head protection. Include the removal and proper disposal of all masking materials in a timely fashion.

16. Provide protection from over-spray and dry fall. Remove all over-spray from adjacent surfaces. Properly clean and remove all over-spray, paint drippings from finished surfaces. Touch up as required due to drippings, overspray.

17. The temporary lighting will be in conformance of the Construction Documents and provided by the electrical contractor. Any additional lighting beyond the electrical scope required to complete this work will be this Contractor's responsibility.

18. This Contractor shall provide adequate ventilation of the work areas by whatever means necessary (i.e., fans, working second shifts, etc.) to ensure that fumes from the products being utilized by the Contractor dissipate quickly to allow other trades to work in the same general area. The fire protection contractor shall cover the sprinkler heads with an approved material to protect it from paint. The painting contractor will remove the covering after painting is complete.

19. This contractor shall include prime and first coat of paint as one mobilization. Finish products will be put in place and final finish coat of paint will be applied just prior to turnover.

20. This Contractor shall be responsible for temporary protection or any finish items while providing the work in this package.

21. This Bid Package to include painting of all site pipe bollards including any used for site signage. Also includes steel site gates and trash enclosure gates/metals.

22. Provide all clean-up for items included with this bid package. All areas are to be kept clean on a daily basis and all debris is to be deposited in a dumpster or trucks provided by this Contractor.

F) LOCKERS

1. Not Used.

2. Not Used.

3. Not Used.

4. This contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed.

5. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

6. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

7. This contractor shall include all traffic control measures necessary to perform, protect this work and to protect the public.

8. Contractor to review and become familiar with the Geotechnical Report which is included as part of the specifications.

9. Furnish and install all lockers and all other components necessary to provide a complete system compatible with all other building components in accordance with the Construction Documents.

10. Furnish and install all lockers. Includes all incidentals, clean up, numbering and anchoring for a complete locker system and installation.

11. This contractor to provide prefabricated bases and tops where required to complete the work within this scope per the Construction Documents.

12. Furnish and install all Locker Room benches.

13. All imperfections in substrate must be brought to the attention of the Construction Manager prior to commencing work. If work is started without notification to Construction Manager, all imperfections will be remedied by this Contractor.

14. Provide a final dusting and cleaning of all lockers inside and out at completion of installation.

15. Provide all clean-up for items included with this bid package. All areas are to be kept clean on a daily basis and all debris is to be deposited in a dumpster or trucks provided by this Contractor.

BID PACKAGE NO. 04 – FIRE SUPPRESSION
Includes Allowance 3 - Contingency

All Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Division 00 and 01 Specification Sections, as well as the Special Conditions above, apply to this Section. Technical Specifications, which relate to this Bid Category, include, but are not limited to the following sections:

02 41 13	Selective Demolition
03 30 00	Cast-In-Place Concrete
21 05 00	Basic Fire Suppression Requirements
21 05 05	Fire Suppression Demolition for Remodeling
21 05 29	Fire Suppression Supports and Anchors
21 05 48	Fire Protection Vibration Isolation
21 05 50	Seismic Requirements for Equipment and Supports
21 05 53	Fire Suppression Identification
21 13 00	Fire Protection Systems

1. This package includes scope of work in the New Police Station Building and in the Renovation of existing Village Hall.

2. Not Used.

3. Not Used.

4. This contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed.

5. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

6. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

7. All construction traffic to utilize the parking/laydown areas. No construction traffic is allowed on other property or alongside adjacent streets.

8. This contractor shall include all traffic control measures necessary to perform, protect this work and to protect the public.

9. This Contractor to meet all seismic requirements per the contract documents. Contractor to review and provide submittals for seismic requirements in accordance with the project specifications.

10. Provide all pipe, pipe fittings, flow alarms, tamper switches, valves, hangers, anchors, control and flow devices and all other components necessary to provide a completely operational fire protection system in accordance with the construction documents and all applicable codes.

11. Provide all testing as required for inspection and acceptance of the fire protection system.

12. Secure all permits and pay all fees necessary to complete the work in this Bid Package.

13. Furnish all miscellaneous structural supports for all suspended or supported fire protection systems equipment, which includes, but is not limited to, hangers, support steel, steel framing, seismic restraints, fasteners, etc. beyond what is indicated on the contract documents for the installation of this work.

14. Furnish only, all appropriately rated access door assemblies as required for access to the fire protection system. This Contractor shall provide dimensioned layout drawings for each location and coordinate installation by others.

15. All piping indicated as painted shall be cleaned and prepared by this Contractor and painted by others.

16. All sprinkler heads on piping to be painted shall be protected by this contractor. The painter will remove protection after painting.

17. This Contractor shall coordinate the routing of all piping to avoid structural items such as: concrete beams, structural steel, joists, masonry bond beams, floor joists, etc. These structures shall not be sleeved or penetrated.

18. Not Used.

19. Coordinate with the masonry contractor all penetrations through masonry walls.

20. Provide complete as-built drawings of all systems installed under this Bid Category. Drawings shall be kept up to date and available for inspection at any time.

21. Furnish and install all water piping and components for a complete on site free standing Fire Department connection per the contract documents. Includes excavation and backfill, interior and exterior piping.

22. Provide fire sprinkler system design and layout per contract documents.
23. Coordinate location of sprinkler heads and piping with other trades prior to beginning work.

24. Plumbing contractor to bring water service into the building above finished floor. Fire sprinkler work to begin as shown on construction drawings. From inside the building, the fire sprinkler contractor shall install piping complete for the installation of the free standing FDC. Refer to Civil drawings for additional information.

25. This contractor is responsible for loading and haul-off site any spoils associated with the Bid Package.

26. This Bid Category specifically excludes the following related work items:
    a) Electrical wiring and connections.

27. Furnish and install any housekeeping pads necessary for this scope.

28. Seal all thru wall and thru floor penetrations associated with this scope per contract documents. Maintain integrity & rating of all firewalls.

29. Furnish and install fire stopping penetration material at fire rated assemblies to meet all applicable codes.

30. Coordinate all layouts of sprinkler system items with MEP contractors and others to avoid conflicts with rough-ins and location of finish items.

31. Provide instructions and training to Owner and selected personnel.

BID PACKAGE NO. 05 – PLUMBING
Includes Allowance 3 - Contingency

All Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Division 00 and 01 Specification Sections, as well as the Special Conditions above, apply to this Section. Technical Specifications, which relate to this Bid Category, include, but are not limited to the following sections:

02 41 13	Selective Demolition
03 30 00	Cast-In-Place Concrete
22 05 00	Basic Plumbing Requirements
22 05 13	Motors
22 05 29	Plumbing Supports and Supports
22 05 50	Seismic Requirements for Equipment and Supports
22 05 53	Plumbing Identification
22 05 93	Plumbing Testing, Adjusting, and Balancing
22 07 19	Plumbing Piping Insulation
22 10 00	Plumbing Piping
22 10 23	Natural Gas and Propane Piping
22 10 30	Plumbing Specialties
22 11 23	Domestic Water Pumps
22 30 00	Plumbing Equipment
22 40 00	Plumbing Fixtures

1. This package includes scope of work in the New Police Station Building and in the Renovation of existing Village Hall.

2. Not Used.

3. Not Used.

4. This contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed.

5. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

6. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

7. All construction traffic to utilize the parking/laydown areas. No construction traffic is allowed on other property or alongside adjacent streets.

8. This contractor shall include all traffic control measures necessary to perform, protect this work and to protect the public.

9. This Contractor shall coordinate the work of this package with all other trades performing adjacent/concurrent work so as to ensure proper, timely, and adequate interface.

10. This Contractor to meet all seismic requirements.

11. Furnish and install all piping, equipment, plumbing fixtures and trim and all other components necessary to provide a complete plumbing system.

12. Furnish and install the complete gas service system. Coordinate final connections with applicable utility company. Furnish all gas piping for the project. Paint all exterior exposed gas piping yellow.

13. FDC is by the Fire Sprinkler Contractor. Review FP & Plumbing drawings for demarcation of work responsibility.

14. This Contractor shall be responsible for providing complete site water and site sanitary sewer systems in compliance with the technical specification sections and all notes and specifications on the plans. Also included are all applicable details on the plans.

15. Include fittings, valves, and other required devices to tie into existing water main per Contract Documents.

16. Includes initial backfill, haunching, bedding and backfill as shown and specified.

17. Furnish and install tracer wire at water lines & sewer lines as shown and specified.

18. Scope of work includes furnishing and installing all valve boxes, fire hydrants, yard hydrants, piping, fittings, valves, devices, equipment, and vaults in accordance with the Contract Documents.

19. Includes all thrust blocking and concrete blocks in accordance with Contract Documents.

20. Maintain proper separation between site water lines and other utility lines per Contract Documents. Includes water and sewer separation requirements as shown and specified.

21. Sanitary sewer system work includes all piping, manhole structures and grades per Contract Documents.

22. Furnish and install all excavation, compacted backfill, under slab water piping, under slab sanitary piping, floor drains, valves, and all other components necessary to provide complete under slab rough-in of piping system.

23. This Contractor to review structural drawings for information related to piping beneath footings, foundations as indicated for typical pipe thru or below foundations. Concrete fill for such piping is by this Contractor.

24. This Contractor shall restore all grades and adjacent work disturbed by the work of this Bid Package.

25. Furnish and install complete building plumbing system in accordance with Contract Documents.

26. Furnish and install complete exterior foundation drainage system per contract documents. Includes bedding material, fabric wrap, backfill, French drains at planters shown on plumbing drawings, cleanouts, and other related items for a complete exterior foundation drainage system. Coordinate this work with foundation contractor for sequencing/layout etc., to avoid damage/disruption to the system. Review all drawings for locations (civil, architectural, plumbing).

27. Furnish and install the under-slab drainage system completely per contract documents. Coordinate with other trades for sequencing, layout, etc., and to avoid disruption/damage to the system. Includes excavation, backfill, fabric, concrete coarse aggregate drainage gravel all per details. Haul off spoils for this work is this contractor’s responsibility.

28. Furnish and install all detention plumbing fixtures.

29. Include complete granular backfill under, and adjacent to paved areas and curbing in accordance with Contract Documents.

30. Provide all trenching and backfill of work under this Bid Package.

31. This Contractor shall achieve all compaction requirements for backfilled areas in accordance with Contract Documents. Backfill to be placed in accordance with the Contract Documents.

32. If Contractor intends to use excavated soil for backfill of site utilities and finds that the soil is too wet to achieve compaction requirements, this Contractor shall be responsible for drying the intended backfill material or obtaining satisfactory backfill material in order to achieve proper compaction.

33. Furnish and install all concrete housekeeping, equipment pads associated with this bid package.

34. Furnish and install all finish plumbing fixtures.

35. This Owner to provide temporary water service for use during construction. Coordinate usage with other trades and Construction Manager.

36. This Contractor must coordinate the installation of utilities around the building with the concrete contractor, masonry contractor, structural steel contractor & other trades. Utilities and structures near the building may need to be left out for crane access.

37. Regarding roof drain piping: Plumbing Contractor to furnish and install all interior roof drain piping and make tie-in at point approximately 5 ft outside the building to storm sewer piping stubbed up by Bid Package 1 Contractor. Plumbing contractor to coordinate and assist the Contractor with location of roof drains for exterior stub up location in order for Plumbing contractor to make necessary below grade tie-ins.

38. Provide all layout for this bid package beyond basic layout provided by other trades.

39. Provide instructions and training to Owner and selected personnel.

40. Furnish and install all miscellaneous structural supports for all suspended or supported plumbing systems equipment, which includes, but is not limited to, hangers, support steel, steel framing, seismic restraints, fasteners, etc. beyond what is indicated on the contract documents for the installation of this work.

41. Include all wall, floor, and roof sleeves as required for work included in this Bid Package.

42. Provide appropriate fire safing at fire rated walls and floors, and acoustic safing at all non-rated sleeved/opening locations. This contractor to maintain fire wall integrity after making penetrations.

43. Furnish and install access door assemblies as required for access to the plumbing systems. This Contractor shall provide dimensioned layout drawings for each location and coordinate with others.

44. Provide sleeves and waterproof seals at all exterior walls and roof penetrations.

45. Include the testing of the plumbing system by area or partial zones as directed by the Construction Manager to allow installation of work by other trades. Include temporary valves, caps or plugs as necessary to accomplish testing by area.

46. All water used for testing shall be drained into connected sewer lines. As required, use temporary piping, pumps or other methods to remove water.

47. Provide all piping for fixtures, fittings, or trap to rough-in and shut-off valves to provide a complete plumbing system for all loose items furnished by others.

48. Furnish and install all piping, equipment, plumbing fixtures and trim and all other components necessary to provide a complete plumbing system.

49. Includes pumps, domestic water heaters, backflow preventers, mixing valves, expansion tanks and neutralization tanks.

50. Excess excavated spoils resulting from the work of this Bid Package shall be hauled off site by this Contractor. Spoils are not allowed to be left on site.

51. Coordinate all tie-ins with city facilities & local utility companies.

52. Contractor will be responsible for keeping the surrounding streets clean from mud and debris resulting from the work of this Bid Package.

53. Includes finish grading and temporary seeding at tie-in locations to existing utilities.

54. This Contractor shall coordinate the work of this package with all other trades performing adjacent/concurrent work so as to ensure proper, timely, and adequate interface.

55. Coordinate with the masonry contractor all penetrations through masonry walls.

56. Includes all clean-outs as shown.

57. Includes backfilling of all structures and re-grading of disturbed areas to original condition.

58. Re-grade all trenched areas as required to restore areas to prior condition.

59. Includes all testing, flushing and disinfection as required and in accordance with the Contract Documents.

60. Include all control wiring for all plumbing systems equipment and between equipment not shown in electrical drawings.

61. Prior to installation of any pipe hangers or supports, this Contractor must verify with the structural engineer that for which the structural component was designed.

62. Cap all piping brought up thru finish slab.

63. During concrete slab pours on-site, this Contractor will provide the manpower necessary to watch the concrete placement around critical areas of piping and floor drains to maintain their original position and tolerance.

64. This Contractor will provide the necessary temporary protection for plumbing fixtures until these items are accepted by the Owner.

65. This Contractor to coordinate the routing of piping to avoid structural items such as: concrete beams, structural steel, joists, masonry bond beams, floor joists, etc. These structures shall not be sleeved or penetrated.

66. Coordinate with concrete contractor all penetrations through concrete panels.

67. This Contractor to furnish and install all roof drains, overflow drains and related piping and insulation. Extend piping to outside of building and make tie-in to storm sewer. Roof drain connection to the site storm sewer is the responsibility of this contractor.

68. This Contractor to take note of any expansion joints in the building and make provisions in the piping to accommodate these joints.

69. All piping indicated as painted shall be cleaned and prepared by this Contractor for painting by others.

70. All work is to be performed in accordance with current codes and standards, i.e. state and local codes/ordinances, NFPA, BOCA, etc.

71. Furnish and install all valve tagging and system identification per contract documents.

72. This contractor to provide temporary water service for other trades, includes piping, excavation, hydrant etc., for temporary water including removal. Water usage fees to be paid by Owner/CM.

73. Provide complete as-built drawings of all systems under this contract. Drawings shall be kept up to date and available for inspection at any time.

74. Provide all clean-up for items included with this bid package. All areas are to be kept clean on a daily basis and all debris is to be deposited in a dumpster or trucks provided by this Contractor.

BID PACKAGE NO. 06 – MECHANICAL
Includes Allowance 3 - Contingency

All Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Division 00 and 01 Specification Sections, as well as the Special Conditions above, apply to this Section. Technical Specifications, which relate to this Bid Category, include, but are not limited to the following sections:

02 41 13	Selective Demolition
03 30 00	Cast-In-Place Concrete
23 05 00	Basic HVAC Requirements
23 05 05	HVAC Demolition for Remodeling
23 05 13	Motors
23 05 29	HVAC Supports and Anchors
23 05 48	HVAC Vibration Isolation
23 05 50	Seismic Requirements for Equipment and Supports
23 05 53	HVAC Identification
23 05 93	Testing, Adjusting, and Balancing for HVAC
23 07 13	Ductwork Insulation
23 09 05	Small Equipment Controls
23 09 13	Instrumentation
23 31 00	Ductwork
23 33 00	Ductwork Accessories
23 34 16	Centrifugal Fans
23 34 23	Power Ventilators
23 36 00	Air Terminal Units
23 37 00	Air Inlets and Outlets
23 74 16.12	Packaged Rooftop Air Conditioning Units 25 Ton and Below
23 81 26	Split System Air Conditioning Units

1. This package includes scope of work in the New Police Station Building and in the Renovation of existing Village Hall.

2. Not Used.

3. Not Used.

4. This contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed.

5. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

6. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

7. All construction traffic to utilize the parking/laydown areas.

8. This contractor shall include all traffic control measures necessary to perform, protect this work and to protect the public.

9. Furnish and install all housekeeping and equipment pads for contractor provided equipment.

10. This Contractor to meet all seismic requirements.

11. Furnish and install all refrigerant piping, insulation, fan coil units, branch selectors, condensing units, roof top units, air handling equipment, rooftop equipment, outdoor air units, makeup air units, curbs for equipment, exhaust fans, air devices, unit heaters, duct work, grilles and diffusers, louvers, and all other components necessary to provide a completely operational HVAC system in accordance with the construction documents and all applicable codes.

12. Includes all VAV's, pumps per schedule, exhaust fans, RTU's, AHU's, louvers, dehumidifier, condensing units, AC units, electric unit heaters, all air devices, hydronic piping and pumps, split-system AC units.

13. Provide all necessary balancing and adjustments as required by HVAC test and balance specification prior to Owner occupancy.

14. Provide all miscellaneous structural supports for all suspended or supported mechanical systems equipment, which include, but are not limited to, hangers, support steel, steel framing, seismic restraints, fasteners, etc. beyond what is indicated on the contract documents for the installation of this work.

15. Provide all wall, floor, and roof sleeves as required for work included in this Bid Package, including required fire safing at fire rated walls and floors, and acoustic safing at all non-rated sleeve locations/ openings. Coordinate any necessary penetrations through foundation, floor, wall, or roof with other contractors. This contractor to provide size of openings and any sleeves necessary for this bid package. This contractor to maintain fire wall integrity after making penetrations to fire wall.

16. Furnish and install all access door assemblies as required for access to mechanical systems. This Contractor shall provide dimensioned layout drawings for each location and coordinate with others.

17. Include sleeves and waterproof seals at all exterior walls and roof penetrations.

18. Coordinate with Bid Package 02 for all exterior wall and roof penetrations.

19. Furnish and install condensate drain piping necessary to reach drainage system in accordance with the construction documents and all applicable codes.

20. Furnish and install all flue piping for mechanical equipment in accordance with the construction documents.

21. Furnish and install all equipment curbs and bases, vibration isolators, equipment anchors, supports, and housekeeping pads required for all heating and air conditioning equipment.

22. Provide complete as-built drawings of all systems installed under this Bid Package. Drawings shall be kept up to date and available for inspection at any time.

23. This Contractor to coordinate the routing of ductwork and piping to avoid structural items such as concrete beams, structural steel, joists, masonry bond beams, floor joists, etc. These structures shall be sleeved or penetrate.

24. This Contractor to take note of any expansion joints in the building and make provisions in the piping to accommodate these joints.

25. This Contractor shall provide final cleaning and filter change of all equipment prior to Owner acceptance and one additional filter change/cleaning during project trim out.

26. All work is to be performed in accordance with current codes and standards, i.e. state and local codes/ordinances, NFPA, BOCA, etc.

27. Provide all necessary balancing and adjustments prior to Owner occupancy.

28. Provide all equipment/device tagging and system identification.

29. Coordinate the work of this contract with the work of other trades performing adjacent work.

30. Coordinate with the masonry contractor all penetrations through masonry walls.

31. Prior to installation of any pipe hangers or supports, this Contractor must verify with the structural engineer that the loads imposed on the building’s structural component shall not exceed that for which the structural component was designed.

32. This Contractor shall cut all openings in the roof deck for HVAC items and provide adequate Temporary protection over these openings to keep the building below in the dry and keep the opening structurally safe for traffic on the roof in accordance with OSHA.

33. Provide instructions and training to Owner and selected personnel.

34. Furnish and install all mechanical piping, including but not limited to, fan coil unit piping, condenser piping, and refrigerant piping. Includes all mechanical piping for the heating/ventilation system.

35. Not Used

36. Furnish and install complete HVAC instrumentation and controls. Temperature controls and wiring is by this contractor.

37. Furnish and install roof top units complete including supports, type “X” drywall, batt insulation, flashings, weather seals, seismic rails all per contract documents.

38. Not Used

39. Furnish and install condensate piping complete. Coordinate tie in locations with Bid Package 05.

40. Provide all clean-up for items included with this bid package. All areas are to be kept clean on a daily basis and all debris is to be deposited in a dumpster or trucks provided by this Contractor.

BID PACKAGE NO. 07 – ELECTRICAL
Includes Allowance 3 - Contingency

All Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Division 00 and 01 Specification Sections, as well as the Special Conditions above, apply to this Section. Technical Specifications, which relate to this Bid Category, include, but are not limited to the following sections:

02 41 13	Selective Demolition
03 30 00	Cast-In-Place Concrete
26 05 00	Basic Electrical Requirements
26 05 05	Electrical Demolition for Remodeling
26 05 13	Wire and Cable
26 05 26	Grounding and Bonding
26 05 27	Supporting Devices
26 05 33	Conduit and Boxes
26 05 48	Seismic Requirements for Equipment and Supports
26 05 53	Electrical Identification
26 05 73	Power System Study
26 09 33	Lighting Control Systems
26 20 00	Service Entrance
26 24 16	Panel Boards
26 27 26	Wiring Devices
26 28 16	Disconnect Switches
26 32 13	Packaged Engine Generator Systems

26 36 00	Transfer Switches
26 43 00	Surge Protective Devices
26 51 19	Led Lighting
27 05 00	Basic Communications Systems Requirements
27 05 05	Technology Demolition for Remodeling
27 05 26	Communications Bonding
27 05 28	Interior Communication Pathway
27 05 53	Identification and Administration
27 11 00	Communication Equipment Rooms (CER)
27 13 00	Backbone Cabling Requirements
27 15 00	Horizontal Cabling Requirements
27 17 00	Testing
28 05 00	Basic Electronic Safety and Security System Requirements
28 05 37	Distributed Antenna System (DAS) for Public System Networks
28 13 00	Electronic Access Control
28 23 00	Video Surveillance
28 31 00	Fire Alarm and Detection Systems

03 20 00	Concrete Reinforcing
03 30 00	Cast-In-Place Concrete
07 84 13	Penetration Firestopping
26 05 19	Low Voltage Electrical Power Conductors and Cables
26 05 26	Grounding & Bonding for Electrical Systems
26 05 29	Hangers and Supports for Electrical Systems
26 05 33	Raceways and Boxes for Electrical Systems
26 05 53	Identification for Electrical Systems
26 24 16	Panel Boards
26 27 26	Wiring Devices
26 32 13	Engine Generator Systems
26 51 00	Interior Lighting
27 13 43	Communications Services, Cabling and Miscellaneous Equipment
28 31 00	Fire Detection and Alarm

1. This package includes scope of work in the New Police Station Building and in the Renovation of existing Village Hall.

2. Furnish and Install temporary lighting for all trades use throughout construction process until final lighting is installed and energized.

3. Furnish and install generator, all associated accessories, and generator concrete pad.

4. This contractor shall pay at a minimum the current Prevailing wage rates listed for the county for which the work is being performed

5. Upon contract award, contractor will execute the Project Labor Agreement (PLA).

6. The contractor is responsible for obtaining a third-party testing facility to provide testing and inspections where required by specifications and local code enforcement.

7. This contractor shall include all traffic control measures necessary to perform, protect this work and to protect the public.

8. This Contractor to meet all seismic requirements per the contract documents. Contractor to review and provide submittals for seismic requirements in accordance with the project specifications.

9. Furnish and install all conduit wire, boxes, covers, devices, switch gear, transformers, power distribution panels, lights and all other components necessary to provide a complete electrical power and lighting system in accordance with the construction documents, compatible with all other building elements, and in conformance with the applicable codes.

10. Furnish and install all conduits, wire boxes, covers, devices, fire alarm panels, and all other components necessary to provide a complete fire alarm and smoke detection system in accordance with the construction documents and compatible with all other building elements.

11. Furnish and install all raceways necessary to rough-in the telephone, A/V, data/communication, and electronic safety and security systems in accordance with the construction documents.

12. Furnish and install all site lighting per the Contract Documents, including concrete bases.

13. Furnish and install all temporary power and lighting in accordance with all applicable laws, rules, codes, ordinances, and government requirements. Temporary electrical usage charges to be paid by Owner.

14. Furnish all miscellaneous structural supports for all suspended or supported electrical systems equipment, which include, but are not limited to, hangers, support steel, steel framing, seismic restraints, fasteners, etc. beyond what is indicated on the Contract Documents for the installation of this work.

15. Include all wall, floor and roof sleeves as required for work in this Bid Package, as well as appropriate fire safing at fire rated walls and floors, and acoustic safing at all non-rated sleeved/opening locations. This contractor to maintain the integrity of all fire walls after making penetrations.

16. Furnish and install all access door assemblies as required for access to the electrical systems.

17. Furnish and install exterior building signage lighting.

18. This Contractor shall provide dimensioned layout drawings for each location and coordinate with others.

19. Include sleeves and waterproof seals at all exterior wall and roof penetrations.

20. This Contractor is responsible for any electrical permit required for this work. The Owner will obtain the general building permit.

21. This Contractor shall coordinate the work of this package with all other trades performing adjacent/concurrent work so as to ensure proper, timely, and adequate interface.

22. Furnish and install all grounding / bonding for building per the contract documents. Coordinate with this work with all the other trades for a complete system.

23. Not Used.

24. Temperature controls and wiring is by the mechanical contractor.

25. Furnish and install starters, disconnects for mechanical equipment on mechanical drawings and specified in Division 23.

26. Furnish and install all rough ins for Photovoltaic per contract documents.

27. Furnish and install all concrete housekeeping pads for this Bid Package.

28. Furnish and install pipe bollards associated with this bid package scope of work and per contract documents.

29. Furnish and install all embeds, anchor bolts, conduits, and concrete bases for all site lighting.

30. Make final connection and hook up to all equipment.

31. Review civil drawings and site electrical and provide all electrical systems, components per the contract documents.

32. Includes all excavation and spoil removal associated with this bid package scope of work. Spoils generated by this contractor are to be loaded and hauled off site by this contractor. Spoils will not be allowed to remain on site.

33. Conduits by Electrical Contractor for power and cabling.

34. This Contractor to furnish and install complete electrical systems and low voltage systems.

35. Furnish and install access control readers, door push plates, pedestals, door wall plates for access control.

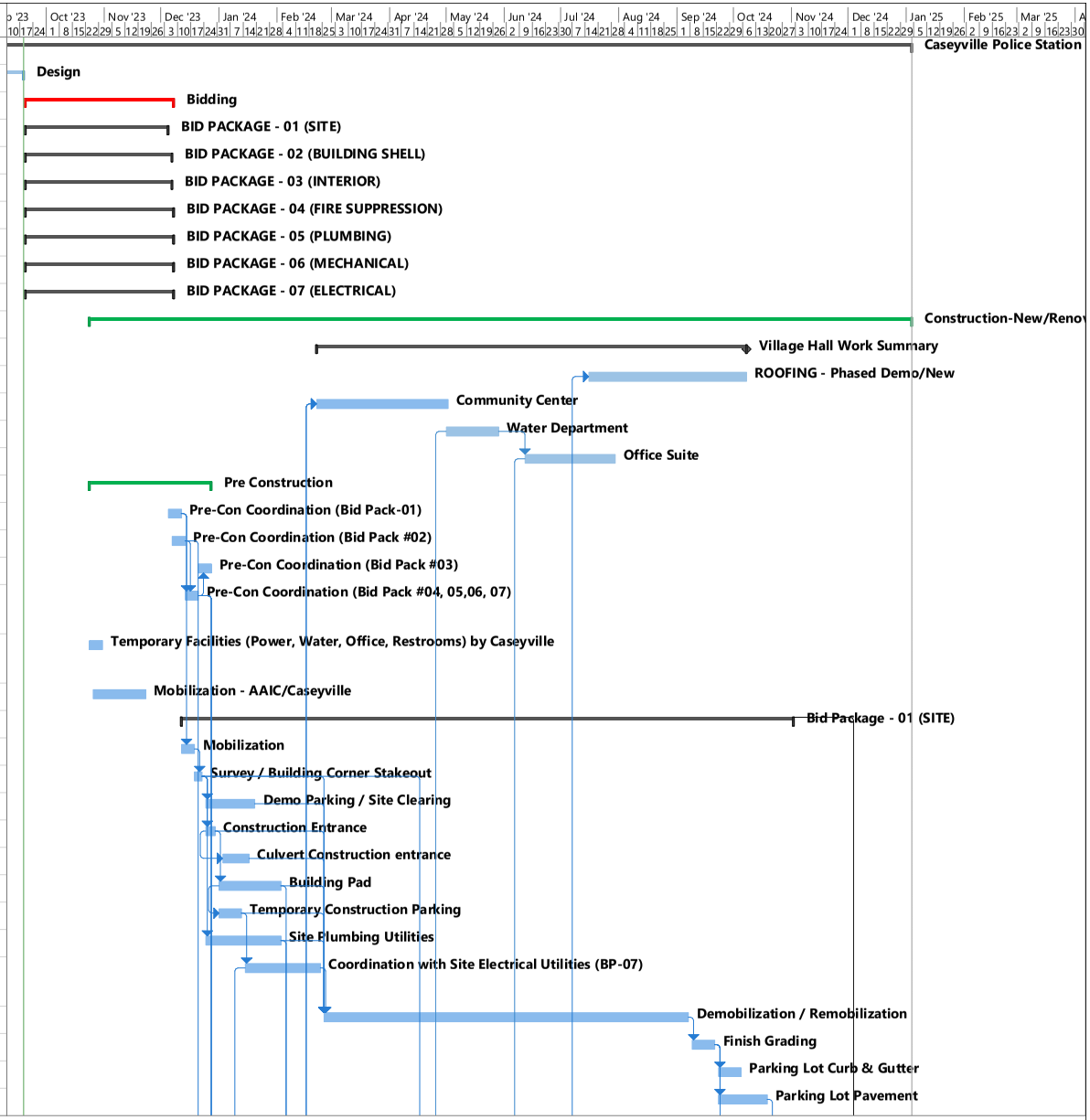
36. Maintain electrical service to building at all times for duration of project.

37. Provide instructions and training to Owner and selected personnel.

38. Coordinate with utility company, owner, and existing equipment for the installation of new service and or extensions of existing service.

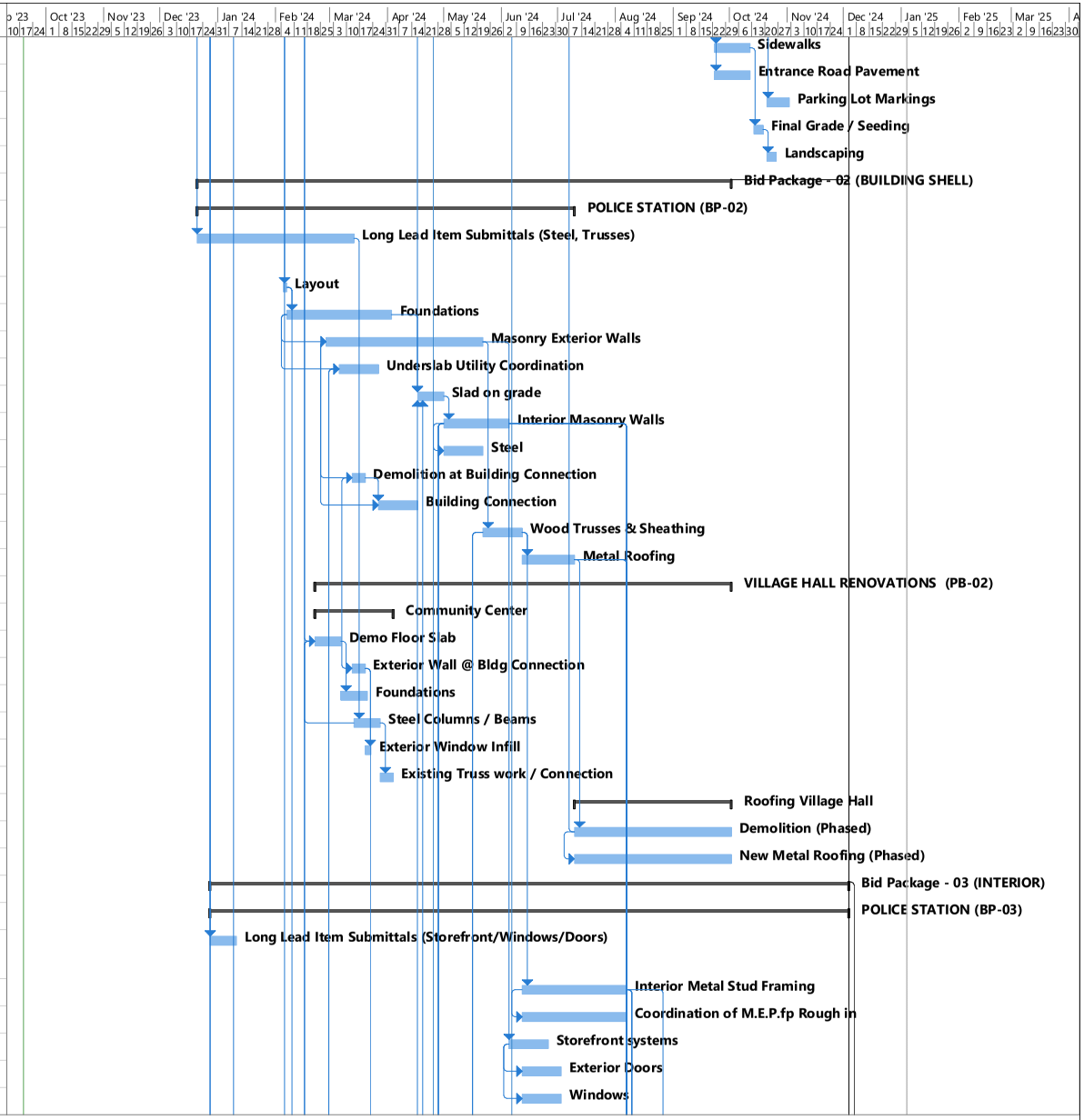
END OF SECTION 011000

ID	Task Mode	Task Name	Duration	Start	Finish
1		**Caseyville Police Station**	**504 days**	**Tue 1/31/23**	**Fri 1/3/25**
2		**Design**	**165 days**	**Tue 1/31/23**	**Mon 9/18/23**
14		**Bidding**	**57 days**	**Wed 9/20/23**	**Thu 12/7/23**
15		**BID PACKAGE - 01 (SITE)**	**54 days**	**Wed 9/20/23**	**Mon 12/4/23**
20		**BID PACKAGE - 02 (BUILDING SHELL)**	**56 days**	**Wed 9/20/23**	**Wed 12/6/23**
25		**BID PACKAGE - 03 (INTERIOR)**	**56 days**	**Wed 9/20/23**	**Wed 12/6/23**
30		**BID PACKAGE - 04 (FIRE SUPPRESSION)**	**57 days**	**Wed 9/20/23**	**Thu 12/7/23**
35		**BID PACKAGE - 05 (PLUMBING)**	**57 days**	**Wed 9/20/23**	**Thu 12/7/23**
40		**BID PACKAGE - 06 (MECHANICAL)**	**57 days**	**Wed 9/20/23**	**Thu 12/7/23**
45		**BID PACKAGE - 07 (ELECTRICAL)**	**57 days**	**Wed 9/20/23**	**Thu 12/7/23**
50		**Construction-New/Renovation**	**314 days**	**Tue 10/24/23**	**Fri 1/3/25**
51		**Village Hall Work Summary**	**163 days**	**Thu 2/22/24**	**Mon 10/7/24**
52		ROOFING - Phased Demo/New	60 days	Tue 7/16/24	Mon 10/7/24
53		Community Center	50 days	Thu 2/22/24	Wed 5/1/24
54		Water Department	20 days	Wed 5/1/24	Tue 5/28/24
55		Office Suite	34 days	Wed 6/12/24	Mon 7/29/24
56		**Pre Construction**	**47 days**	**Tue 10/24/23**	**Wed 12/27/23**
57		Pre-Con Coordination (Bid Pack-01)	5 days	Tue 12/5/23	Mon 12/11/23
58		Pre-Con Coordination (Bid Pack #02)	5 days	Thu 12/7/23	Wed 12/13/23
59		Pre-Con Coordination (Bid Pack #03)	5 days	Thu 12/21/23	Wed 12/27/23
60		Pre-Con Coordination (Bid Pack #04, 05,06, 07)	5 days	Thu 12/14/23	Wed 12/20/23
61		Temporary Facilities (Power, Water, Office, Restrooms) by Caseyville	5 days	Tue 10/24/23	Mon 10/30/23
62		Mobilization - AAIC/Caseyville	20 days	Thu 10/26/23	Wed 11/22/23
63		**Bid Package - 01 (SITE)**	**234 days**	**Tue 12/12/23**	**Fri 11/1/24**
64		**Mobilization**	5 days	Tue 12/12/23	Mon 12/18/23
65		Survey / Building Corner Stakeout	4 days	Tue 12/19/23	Fri 12/22/23
66		Demo Parking / Site Clearing	20 days	Mon 12/25/23	Fri 1/19/24
67		Construction Entrance	5 days	Mon 12/25/23	Fri 12/29/23
68		Culvert Construction entrance	10 days	Wed 1/3/24	Tue 1/16/24
69		Building Pad	25 days	Mon 1/1/24	Fri 2/2/24
70		Temporary Construction Parking	10 days	Mon 1/1/24	Fri 1/12/24
71		Site Plumbing Utilities	30 days	Mon 12/25/23	Fri 2/2/24
72		Coordination with Site Electrical Utilities (BP-07)	30 days	Mon 1/15/24	Fri 2/23/24
73		**Demobilization / Remobilization**	**140 days**	**Mon 2/26/24**	**Fri 9/6/24**
74		Finish Grading	10 days	Mon 9/9/24	Fri 9/20/24
75		Parking Lot Curb & Gutter	10 days	Mon 9/23/24	Fri 10/4/24
76		Parking Lot Pavement	20 days	Mon 9/23/24	Fri 10/18/24



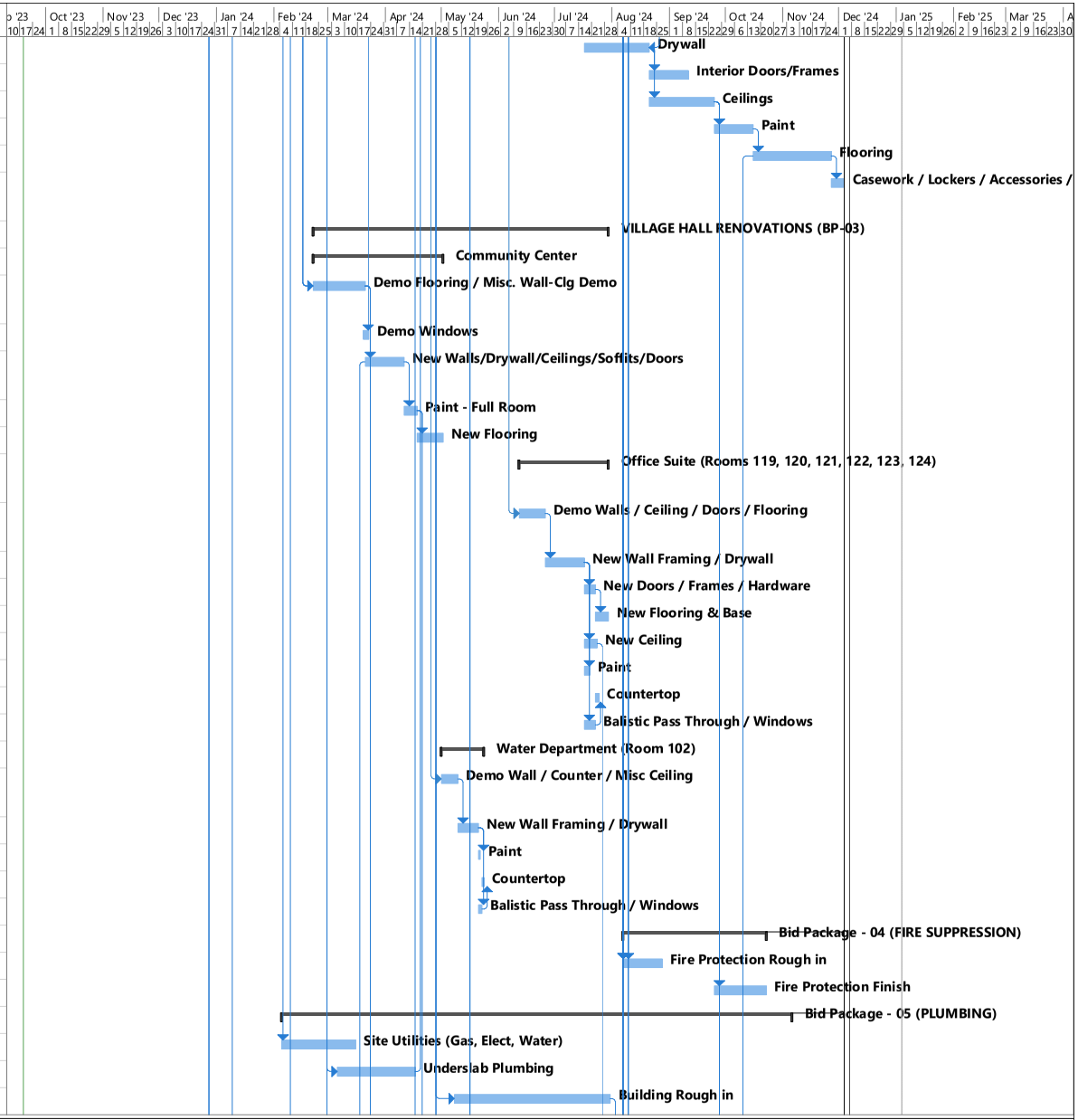
Task | Project Summary | Manual Task | Start-only | Deadline
Split | Inactive Task | Duration-only | Finish-only | Progress
Milestone | Inactive Milestone | Manual Summary Rollup | External Tasks | Manual Progress
Summary | Inactive Summary | Manual Summary | External Milestone

ID	Task Mode	Task Name	Duration	Start	Finish
77		Sidewalks	15 days	Mon 9/23/24	Fri 10/11/24
78		Entrance Road Pavement	15 days	Mon 9/23/24	Fri 10/11/24
79		Parking Lot Markings	10 days	Mon 10/21/24	Fri 11/1/24
80		Final Grade / Seeding	5 days	Mon 10/14/24	Fri 10/18/24
81		Landscaping	5 days	Mon 10/21/24	Fri 10/25/24
82		**Bid Package - 02 (BUILDING SHELL)**	**204 days**	**Thu 12/21/23**	**Tue 10/1/24**
83		**POLICE STATION (BP-02)**	**144 days**	**Thu 12/21/23**	**Tue 7/9/24**
84		Long Lead Item Submittals (Steel, Trusses)	60 days	Thu 12/21/23	Wed 3/13/24
85		Layout	2 days	Mon 2/5/24	Tue 2/6/24
86		Foundations	40 days	Wed 2/7/24	Tue 4/2/24
87		Masonry Exterior Walls	60 days	Wed 2/28/24	Tue 5/21/24
88		Underslab Utility Coordination	15 days	Wed 3/6/24	Tue 3/26/24
89		Slad on grade	10 days	Wed 4/17/24	Tue 4/30/24
90		Interior Masonry Walls	25 days	Wed 5/1/24	Tue 6/4/24
91		Steel	15 days	Wed 5/1/24	Tue 5/21/24
92		Demolition at Building Connection	5 days	Wed 3/13/24	Tue 3/19/24
93		Building Connection	15 days	Wed 3/27/24	Tue 4/16/24
94		Wood Trusses & Sheathing	15 days	Wed 5/22/24	Tue 6/11/24
95		Metal Roofing	20 days	Wed 6/12/24	Tue 7/9/24
96		**VILLAGE HALL RENOVATIONS (PB-02)**	**159 days**	**Thu 2/22/24**	**Tue 10/1/24**
97		**Community Center**	**30 days**	**Thu 2/22/24**	**Wed 4/3/24**
98		Demo Floor Slab	10 days	Thu 2/22/24	Wed 3/6/24
99		Exterior Wall @ Bldg Connection	5 days	Wed 3/13/24	Tue 3/19/24
100		Foundations	10 days	Thu 3/7/24	Wed 3/20/24
101		Steel Columns / Beams	10 days	Thu 3/14/24	Wed 3/27/24
102		Exterior Window Infill	3 days	Wed 3/20/24	Fri 3/22/24
103		Existing Truss work / Connection	5 days	Thu 3/28/24	Wed 4/3/24
104		**Roofing Village Hall**	**60 days**	**Wed 7/10/24**	**Tue 10/1/24**
105		Demolition (Phased)	60 days	Wed 7/10/24	Tue 10/1/24
106		New Metal Roofing (Phased)	60 days	Wed 7/10/24	Tue 10/1/24
107		**Bid Package - 03 (INTERIOR)**	***244 days***	***Thu 12/28/23***	***Tue 12/3/24***
108		**POLICE STATION (BP-03)**	**244 days**	**Thu 12/28/23**	**Tue 12/3/24**
109		Long Lead Item Submittals (Storefront/Windows/Doors)	10 days	Thu 12/28/23	Wed 1/10/24
110		Interior Metal Stud Framing	40 days	Wed 6/12/24	Tue 8/6/24
111		Coordination of M.E.P.fp Rough in	40 days	Wed 6/12/24	Tue 8/6/24
112		Storefront systems	15 days	Wed 6/5/24	Tue 6/25/24
113		Exterior Doors	15 days	Wed 6/12/24	Tue 7/2/24
114		Windows	15 days	Wed 6/12/24	Tue 7/2/24



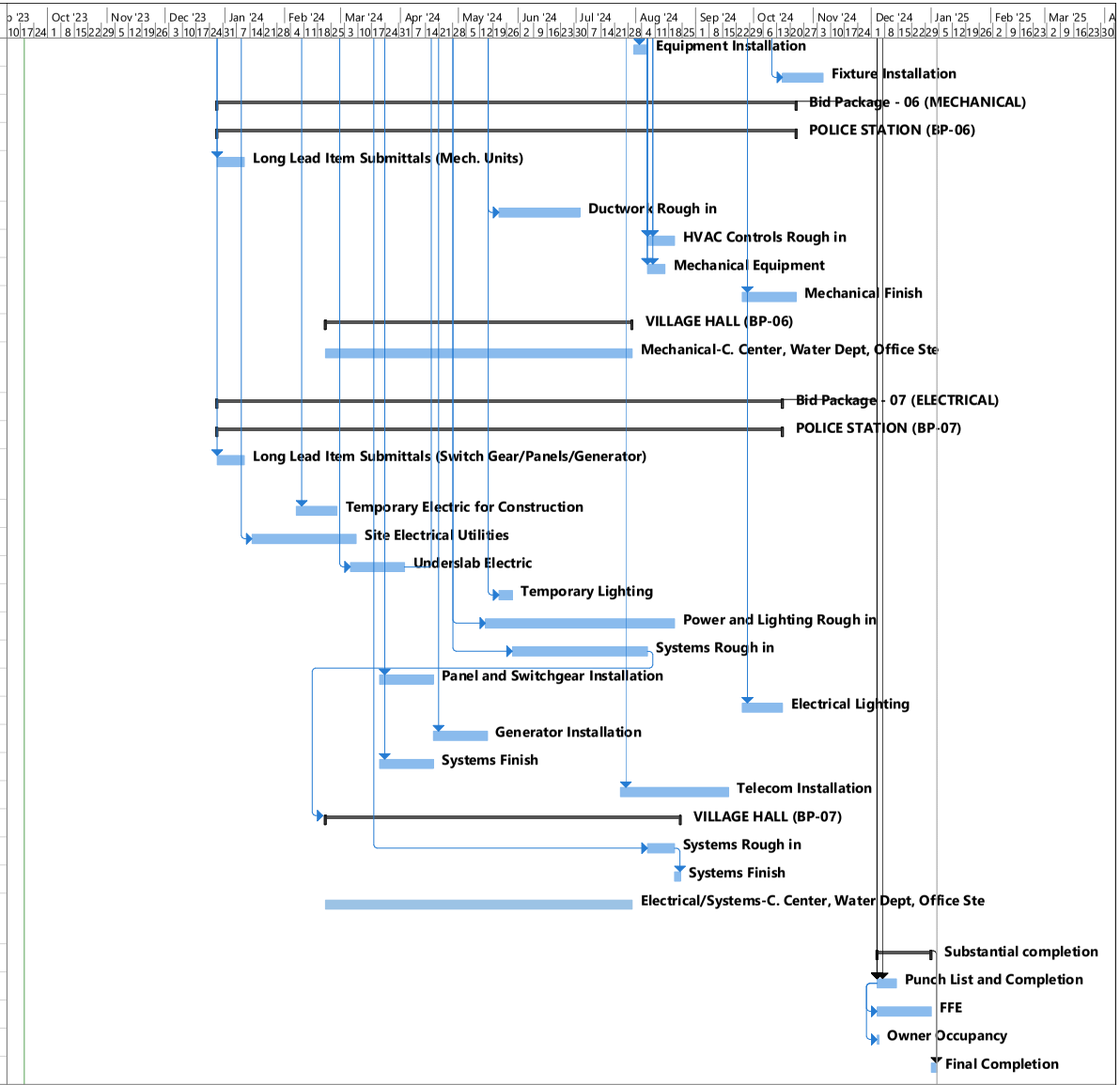
Task | Project Summary | Manual Task | Start-only | Deadline
Split | Inactive Task | Duration-only | Finish-only | Progress
Milestone | Inactive Milestone | Manual Summary Rollup | External Tasks | Manual Progress
Summary | Inactive Summary | Manual Summary | External Milestone

ID	Task Mode	Task Name	Duration	Start	Finish
115		Drywall	25 days	Wed 7/17/24	Tue 8/20/24
116		Interior Doors/Frames	15 days	Wed 8/21/24	Tue 9/10/24
117		Ceilings	25 days	Wed 8/21/24	Tue 9/24/24
118		Paint	15 days	Wed 9/25/24	Tue 10/15/24
119		Flooring	30 days	Wed 10/16/24	Tue 11/26/24
120		Casework / Lockers / Accessories / Equipment	5 days	Wed 11/27/24	Tue 12/3/24
121		**VILLAGE HALL RENOVATIONS (BP-03)**	**113 days**	**Thu 2/22/24**	**Mon 7/29/24**
122		**Community Center**	**50 days**	**Thu 2/22/24**	**Wed 5/1/24**
123		Demo Flooring / Misc. Wall-Clg Demo	20 days	Thu 2/22/24	Wed 3/20/24
124		Demo Windows	3 days	Wed 3/20/24	Fri 3/22/24
125		New Walls/Drywall/Ceilings/Soffits/Doors	15 days	Thu 3/21/24	Wed 4/10/24
126		Paint - Full Room	5 days	Thu 4/11/24	Wed 4/17/24
127		New Flooring	10 days	Thu 4/18/24	Wed 5/1/24
128		**Office Suite (Rooms 119, 120, 121, 122, 123, 124)**	**34 days**	**Wed 6/12/24**	**Mon 7/29/24**
129		Demo Walls / Ceiling / Doors / Flooring	10 days	Wed 6/12/24	Tue 6/25/24
130		New Wall Framing / Drywall	15 days	Wed 6/26/24	Tue 7/16/24
131		New Doors / Frames / Hardware	4 days	Wed 7/17/24	Mon 7/22/24
132		New Flooring & Base	5 days	Tue 7/23/24	Mon 7/29/24
133		New Ceiling	5 days	Wed 7/17/24	Tue 7/23/24
134		Paint	3 days	Wed 7/17/24	Fri 7/19/24
135		Countertop	2 days	Tue 7/23/24	Wed 7/24/24
136		Balistic Pass Through / Windows	4 days	Wed 7/17/24	Mon 7/22/24
137		**Water Department (Room 102)**	**17 days**	**Wed 5/1/24**	**Thu 5/23/24**
138		Demo Wall / Counter / Misc Ceiling	7 days	Wed 5/1/24	Thu 5/9/24
139		New Wall Framing / Drywall	7 days	Fri 5/10/24	Mon 5/20/24
140		Paint	1 day	Tue 5/21/24	Tue 5/21/24
141		Countertop	1 day	Thu 5/23/24	Thu 5/23/24
142		Balistic Pass Through / Windows	2 days	Tue 5/21/24	Wed 5/22/24
143		**Bid Package - 04 (FIRE SUPPRESSION)**	**55 days**	**Wed 8/7/24**	**Tue 10/22/24**
144		Fire Protection Rough in	15 days	Wed 8/7/24	Tue 8/27/24
145		Fire Protection Finish	20 days	Wed 9/25/24	Tue 10/22/24
146		**Bid Package - 05 (PLUMBING)**	**197 days**	**Mon 2/5/24**	**Tue 11/5/24**
147		Site Utilities (Gas, Elect, Water)	30 days	Mon 2/5/24	Fri 3/15/24
148		Underslab Plumbing	30 days	Wed 3/6/24	Tue 4/16/24
149		Building Rough in	60 days	Wed 5/8/24	Tue 7/30/24



Task | Split | Milestone | Summary | Project Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Deadline | Progress | Manual Progress

ID	Task Mode	Task Name	Duration	Start	Finish
150		Equipment Installation	5 days	Wed 7/31/24	Tue 8/6/24
151		Fixture Installation	15 days	Wed 10/16/24	Tue 11/5/24
152		**Bid Package - 06 (MECHANICAL)**	**214 days**	**Thu 12/28/23**	**Tue 10/22/24**
153		**POLICE STATION (BP-06)**	**214 days**	**Thu 12/28/23**	**Tue 10/22/24**
154		Long Lead Item Submittals (Mech. Units)	10 days	Thu 12/28/23	Wed 1/10/24
155		Ductwork Rough in	30 days	Wed 5/22/24	Tue 7/2/24
156		HVAC Controls Rough in	10 days	Wed 8/7/24	Tue 8/20/24
157		Mechanical Equipment	7 days	Wed 8/7/24	Thu 8/15/24
158		Mechanical Finish	20 days	Wed 9/25/24	Tue 10/22/24
159		**VILLAGE HALL (BP-06)**	**113 days**	**Thu 2/22/24**	**Mon 7/29/24**
160		Mechanical-C. Center, Water Dept, Office Ste	113 days	Thu 2/22/24	Mon 7/29/24
161		**Bid Package - 07 (ELECTRICAL)**	**209 days**	**Thu 12/28/23**	**Tue 10/15/24**
162		**POLICE STATION (BP-07)**	**209 days**	**Thu 12/28/23**	**Tue 10/15/24**
163		Long Lead Item Submittals (Switch Gear/Panels/Generator)	10 days	Thu 12/28/23	Wed 1/10/24
164		Temporary Electric for Construction	15 days	Wed 2/7/24	Tue 2/27/24
165		Site Electrical Utilities	40 days	Mon 1/15/24	Fri 3/8/24
166		Underslab Electric	20 days	Wed 3/6/24	Tue 4/2/24
167		Temporary Lighting	5 days	Wed 5/22/24	Tue 5/28/24
168		Power and Lighting Rough in	70 days	Wed 5/15/24	Tue 8/20/24
169		Systems Rough in	50 days	Wed 5/29/24	Tue 8/6/24
170		Panel and Switchgear Installation	20 days	Thu 3/21/24	Wed 4/17/24
171		Electrical Lighting	15 days	Wed 9/25/24	Tue 10/15/24
172		Generator Installation	20 days	Thu 4/18/24	Wed 5/15/24
173		Systems Finish	20 days	Thu 3/21/24	Wed 4/17/24
174		Telecom Installation	40 days	Wed 7/24/24	Tue 9/17/24
175		**VILLAGE HALL (BP-07)**	**132 days**	**Thu 2/22/24**	**Fri 8/23/24**
176		Systems Rough in	10 days	Wed 8/7/24	Tue 8/20/24
177		Systems Finish	3 days	Wed 8/21/24	Fri 8/23/24
178		Electrical/Systems-C. Center, Water Dept, Office Ste	113 days	Thu 2/22/24	Mon 7/29/24
179		**Substantial completion**	**20 days**	**Wed 12/4/24**	**Tue 12/31/24**
180		Punch List and Completion	8 days	Wed 12/4/24	Fri 12/13/24
181		FFE	20 days	Wed 12/4/24	Tue 12/31/24
182		Owner Occupancy	1 day	Wed 12/4/24	Wed 12/4/24
183		**Final Completion**	3 days	Wed 1/1/25	Fri 1/3/25



Task
Split
Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Progress
Manual Progress

SECTION 01 21 00 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor(s). If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.

C. Related Requirements:

1. Section 01 10 00 “Project Summary Bid Packages”

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.4 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.7 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor(s) of specific products and materials ordered by Owner or selected by Architect under allowance and shall include freight and delivery to Project site.

B. Unless otherwise indicated, Contractor(s) costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.8 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
3. Owner has right to reduce the amount or eliminate at their discretion.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor(s) handling, labor, installation, overhead, and profit.

1. Do not include Contractor(s) or subcontractor(s) indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has

changed from what could have been foreseen from information in the Contract Documents.

2. No change to Contractor(s) indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1 – Roof Sheathing: Lump-Sum Allowance for removal and replacement of existing roof sheathing on Village Hall building. Include the sum of $20,000.00

1. This allowance includes material cost, receiving, handling, off-site storage, and installation, and Contractor(s) overhead and profit. This allowance will be utilized to determine a unit price prior to any work commencing.

B. Allowance No. 2 – Building Plaque: Lump-Sum Allowance: Include the sum of $6,500.00

1. This allowance includes material cost, receiving, handling, off-site storage, and installation, and Contractor(s) overhead and profit.

C. Allowance No. 3 – Contingency: Lump-Sum Allowance: Include in the Base Bid a contingency of ten percent (10%) of entire bid amount.

1. This allowance includes material cost, receiving, handling, off-site storage, and installation, and Contractor(s) overhead and profit. The unused portion of the contingency shall be deducted from the Contract price before final payment is made.

D. Allowance No. 4 – Contingency: Lump-Sum Allowance: Include in the Base Bid a contingency of twenty percent (20%) of entire bid amount.

1. This allowance includes material cost, receiving, handling, off-site storage, and installation, and Contractor(s) overhead and profit. The unused portion of the contingency shall be deducted from the Contract price before final payment is made.

E. Allowance No. 5 – Dimensional Letter Signage and Badge: Lump-Sum Allowance: Include the sum of $40,000.00

1. This allowance includes material cost, receiving, handling, off-site storage, and installation, and Contractor(s) overhead and profit.

END OF SECTION 01 21 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:
   1. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

   1. Substitution Request Form: Use CSI Form 1.5C or approved equal.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

      a. Statement indicating why specified product or fabrication, or installation cannot be provided, if applicable.
      b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Owner's Action: If necessary, Owner will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Owner will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Owner does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Owner will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Owner will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Owner will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Owner.

1. Conditions: Owner will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Owner will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

2. Section 01 10 00 “Project Summary – Bid Packages / Schedule” for bid package coordination and project schedule.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
e. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 01 21 00 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

B. Unit-Price Adjustment: See Section 01 22 00 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
   1. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.

   1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

      a. Application for Payment forms with continuation sheets.
      b. Submittal schedule.
      c. Items required to be indicated as separate activities in Contractor's construction schedule.
      d. Any items indicated in Federal, Special, and State Provision sections.

   2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

   a. Project name and location.
   b. Name of Architect.
   c. Architect's project number.
   d. Contractor's name and address.
   e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

   b. Differentiate per separate subcontracts.

4. Provide separate line items in the schedule of values for initial cost of materials, labor, for each subsequent stage of completion, and for total installed value of that part of the Work.
5. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
6. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

7. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Architect by the fifth day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site. Special permissions are required for payment of items stored off-site; refer to Section 9.3.2 of General Conditions.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

G. Transmittal: Submit Four signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

I. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

J. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Schedule of unit prices.
6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
8. Copies of building permits.
9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
10. Initial progress report.
11. Report of preconstruction conference.

K. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

L. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

M. DBE Payment Certifications: See included forms #1 and #2 regarding DBE forms to be submitted timely. The Monthly DBE Status Report shall be submitted along with the monthly pay application or directly to MCT’s DBE Liaison Officer (DBELO). The DBE Payment Certification shall be submitted directly to MCT’s DBELO within 15 days of payment.”

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Working Hours and Notifications.
2. General coordination procedures.
3. Coordination drawings.
4. Requests for Information (RFIs).
5. Project meetings.

B. Working Hours and Notifications

1. All work shall be completed during the hours of 7 a.m. and 5:00 p.m. Monday thru Friday excluding holidays. Any change in the work schedule must be approved by the Owner.
2. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:

1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.
3. Section 01 10 00 “Project Summary – Bid Packages / Schedule” for bid package coordination and project schedule.

1.3 DEFINITIONS

A. RFI (Request For Information): Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

    a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
    c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    f. Indicate required installation sequences.
    g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
2. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
3. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
4. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.

5. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format.
3. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

    a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
    b. Digital Data Software Program: Drawings are available in AutoCadd 2013.
    c. Contractor shall execute a data licensing agreement in the form of AIA Document C106.

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for approval of Contractor's means and methods.
d. Requests for coordination information already indicated in the Contract Documents.
e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Critical work sequencing and long-lead items.
    c. Designation of key personnel and their duties.
    d. Lines of communications.
    e. Procedures for processing field decisions and Change Orders.
    f. Procedures for RFIs.
    g. Procedures for testing and inspecting.
    h. Procedures for processing Applications for Payment.
    i. Distribution of the Contract Documents.
    j. Submittal procedures.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, and Owner's Representatives of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Deliveries.
    f. Submittals.
    g. Review of mockups.
    h. Possible conflicts.
    i. Compatibility requirements.
    j. Time schedules.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at weekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.

4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Special reports.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
2. Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.
3. Section 01 10 00 “Project Summary – Bid Packages / Schedule” for bid package coordination and project schedule.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.

B. Startup construction schedule.

1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

E. Construction Schedule Updating Reports: Submit with Applications for Payment.

F. Daily Construction Reports: Submit at weekly intervals.

G. Material Location Reports: Submit at monthly intervals.

H. Site Condition Reports: Submit at time of discovery of differing conditions.

I. Special Reports: Submit at time of unusual event.

1.4 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as

separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.

1. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
2. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    a. Structural completion.
    b. Temporary enclosure and space conditioning.
    c. Permanent space enclosure.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to:
1. Notice to Proceed
2. Completion of the foundations
3. Completion of the building shell
4. Substantial Completion
5. Final completion

6. Temporary enclosure and space conditioning.

E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Section 01 29 00 "Payment Procedures" for cost reporting and payment procedures.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.

2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

1. Use Microsoft Project, for Windows operating system.

2.2 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for the Notice to Proceed. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. Approximate count of personnel at Project site.
3. Equipment at Project site.
4. Material deliveries.
5. High and low temperatures and general weather conditions, including presence of rain or snow.

6. Accidents.
7. Meetings and significant decisions.
8. Unusual events (see special reports).
9. Stoppages, delays, shortages, and losses.
10. Meter readings and similar recordings.
11. Emergency procedures.
12. Orders and requests of authorities having jurisdiction.
13. Change Orders received and implemented.
14. Work Change Directives received and implemented.
15. Services connected and disconnected.
16. Equipment or system tests and startups.
17. Partial completions and occupancies.
18. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

C. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing, commissioning and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Requirements for Mockup construction.

C. Related Requirements:

1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
6. All Material Specifications.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard

Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Specification Section number and title.
    b. Submittal category: Action; informational.
    c. Name of subcontractor.
    d. Description of the Work covered.
    e. Scheduled date for Architect's final release or approval.
    f. Scheduled date of fabrication.
    g. Scheduled dates for purchasing.
    h. Scheduled dates for installation.
    i. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.

1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project Record Drawings.

a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
b. Digital Drawing Software Program: The Contract Drawings are available in Revit 14.
c. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.
d. The following digital data files will by furnished for each appropriate discipline:

1) Floor plans.
2) Reflected ceiling plans.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.

4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner, containing the following information:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Contractor.
    e. Name of firm or entity that prepared submittal.
    f. Names of subcontractor, manufacturer, and supplier.
    g. Category and type of submittal.
    h. Submittal purpose and description.
    i. Specification Section number and title.
    j. Specification paragraph number or drawing designation and generic name for each of multiple items.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Related physical samples submitted directly.
    n. Indication of full or partial submittal.
    o. Transmittal number, numbered consecutively.
    p. Submittal and transmittal distribution record.
    q. Other necessary identification.
    r. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

    a. Project name.
    b. Number and title of appropriate Specification Section.
    c. Manufacturer name.
    d. Product name.

E. Options: Identify options requiring selection by Architect.

F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installer’s, authorities having jurisdiction, and others as

necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project.

    a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Submit electronic submittals via email as PDF electronic files.

    a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.

b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Notation of coordination requirements.
g. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
3. Submit Shop Drawings in the following format:

a. PDF electronic file.

4. BIM File Incorporation: Develop and incorporate Shop Drawing files into Building Information Model established for Project.

a. Prepare Shop Drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.
b. Refer to Section 01 31 00 "Project Management and Coordination" for requirements for coordination drawings.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
    e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

E. Mock-Up Panels Required:

1. Exterior Wall Mock-Up: By Bid Package 02 – SITE: Comply with material specifications. Comply with wall details. Provide full samples of installed exterior wall system including but not limited to:
    a. Any exposed concrete.
    b. Any and all masonry.
    c. Any exposed steel or metal.
    d. Any and all wall panels.
    e. Any and all flashing, coping, and trim.
    f. Exterior doors, frames, windows, storefront,
    g. All expansion joint material and caulking.
    h. All barriers including but not limited to vapor barriers and insulation systems.
    i. Any and all roof edge, cap, coping, flashing and trim.
    j. Any and all wall framing as required.

2. Interior Wall Mock-Up: By Bid Package 03 – INTERIOR: Comply with material specifications. Comply with wall details. Provide full samples of installed interior wall/ceiling system including but not limited to:
    a. Interior framing.
    b. Gypsum board and assemblies, material and finish.
    c. Any and All wall coverings.
    d. Interior painting with optional finishes.
    e. Any and all trim, wainscotting and base.
    f. Any and all ceiling types, framing and finish.
    g. Railings, stairs, treads, risers, finishes.
    h. Any and all frames, including but not limited to windows and doors.

i. All finish caulking.
j. All finish painting including optional sheens as requested.

3. Mock-up panels shall include project specific materials. Provide initial color requests to owner before mock-up begins. Panel to included preferred color selections from owner.
4. Notify A/E when mock-ups are ready for official review.
5. Allow 15 Working days for proper approvals after full completion of any mock-ups.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 01 31 00 "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 "Construction Progress Documentation."

H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 29 00 "Payment Procedures."

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 40 00 "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 "Closeout Procedures."

K. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."

L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 77 00 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

D. Provide sample, color sections, mock-up’s, early in project schedule to allow sufficient review and approval times and coordination with A/E and Owner’s Representatives.

3.2 ARCHITECT’S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:

1. NET (No Exception Taken); MCN (Make Corrections Noted); RR (Revise and Resubmit); R (Rejected).

B. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 01 33 00

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. All Testing and Inspecting services are the General Contractors responsibility via a third-party testing service.

B. Section includes administrative and procedural requirements for quality assurance and quality control.

C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.

D. Related Sections
1. Section 01 10 00 “Project Summary – Bid Packages / Schedule” for bid package coordination and project schedule.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.

D. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

E. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

G. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

H. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: All Contractors Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar

documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

E. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1.9 QUALITY CONTROL

A. Contractor Responsibilities: Tests and inspections are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

C. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, Commissioning Authority, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Contractor will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

B. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, Commissioning Authority, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.

3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and

effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
4. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
5. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
6. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
7. AGA - American Gas Association; www.aga.org.
8. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
9. AI - Asphalt Institute; www.asphaltinstitute.org.
10. AIA - American Institute of Architects (The); www.aia.org.
11. AISC - American Institute of Steel Construction; www.aisc.org.
12. AISI - American Iron and Steel Institute; www.steel.org.
13. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
14. ANSI - American National Standards Institute; www.ansi.org.
15. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
16. APA - APA - The Engineered Wood Association; www.apawood.org.
17. APA - Architectural Precast Association; www.archprecast.org.
18. API - American Petroleum Institute; www.api.org.
19. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
20. ARI - American Refrigeration Institute; (See AHRI).
21. ASCE - American Society of Civil Engineers; www.asce.org.
22. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
23. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
24. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.

25. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
26. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
27. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
28. AWI - Architectural Woodwork Institute; www.awinet.org.
29. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
30. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
31. AWS - American Welding Society; www.aws.org.
32. AWWA - American Water Works Association; www.awwa.org.
33. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
34. BIA - Brick Industry Association (The); www.gobrick.com.
35. CDA - Copper Development Association; www.copper.org.
36. CEA - Consumer Electronics Association; www.ce.org.
37. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
38. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
39. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
40. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
41. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
42. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
43. CSI - Construction Specifications Institute (The); www.csinet.org.
44. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
45. DHI - Door and Hardware Institute; www.dhi.org.
46. ECA - Electronic Components Association; www.ec-central.org.
47. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
48. EIA - Electronic Industries Alliance; (See TIA).
49. EIMA - EIFS Industry Members Association; www.eima.com.
50. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
51. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
52. FM Approvals - FM Approvals LLC; www.fmglobal.com.
53. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
54. FSA - Fluid Sealing Association; www.fluidsealing.com.
55. GA - Gypsum Association; www.gypsum.org.
56. GANA - Glass Association of North America; www.glasswebsite.com.
57. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
58. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
59. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
60. ICBO - International Conference of Building Officials; (See ICC).
61. ICC - International Code Council; www.iccsafe.org.
62. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
63. IESNA - Illuminating Engineering Society of North America; (See IES).
64. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
65. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
66. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.

67. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
68. LMA - Laminating Materials Association; (See CPA).
69. LPI - Lightning Protection Institute; www.lightning.org.
70. MBMA - Metal Building Manufacturers Association; www.mbma.com.
71. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
72. MPI - Master Painters Institute; www.paintinfo.com.
73. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
74. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
75. NCMA - National Concrete Masonry Association; www.ncma.org.
76. NEBB - National Environmental Balancing Bureau; www.nebb.org.
77. NECA - National Electrical Contractors Association; www.necanet.org.
78. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
79. NFPA - NFPA International; (See NFPA).
80. NFRC - National Fenestration Rating Council; www.nfrc.org.
81. NLGA - National Lumber Grades Authority; www.nlga.org.
82. NRCA - National Roofing Contractors Association; www.nrca.net.
83. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
84. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
85. NSPE - National Society of Professional Engineers; www.nspe.org.
86. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
87. PDI - Plumbing & Drainage Institute; www.pdionline.org.
88. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
89. RFCI - Resilient Floor Covering Institute; www.rfci.com.
90. SDI - Steel Deck Institute; www.sdi.org.
91. SDI - Steel Door Institute; www.steeldoor.org.
92. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
93. SJI - Steel Joist Institute; www.steeljoist.org.
94. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
95. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
96. SPIB - Southern Pine Inspection Bureau; www.spib.org.
97. SPRI - Single Ply Roofing Industry; www.spri.org.
98. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
99. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
100. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
101. TMS - The Masonry Society; www.masonrysociety.org.
102. UL - Underwriters Laboratories Inc.; www.ul.com.
103. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
104. USGBC - U.S. Green Building Council; www.usgbc.org.
105. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
106. WDMA - Window & Door Manufacturers Association; www.wdma.com.
107. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. ICC - International Code Council; www.iccsafe.org.
2. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
2. DOC - Department of Corrections
3. DOD - Department of Defense; http://dodssp.daps.dla.mil.
4. DOE - Department of Energy; www.energy.gov.
5. EPA - Environmental Protection Agency; www.epa.gov.
6. OSHA - Occupational Safety & Health Administration; www.osha.gov.
7. SD - Department of State; www.state.gov.
8. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 01 - TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 BASE BID

A. All Bid Package Contractors provide and maintain methods, equipment, and temporary construction, as necessary, to provide controls over environmental conditions at the Work site and related areas under contractor’s control. Remove physical evidence of temporary facilities at completion of Work.

B. Noise Control

C. Lighting

D. Dust Control

E. Water Control

F. Pest Control

G. Debris Control

H. Pollution Control

I. Erosion Control

J. Vibration Control

K. Moisture and Mold Control

L. Safety and Security

1.3 NOISE CONTROL

A. Contractor shall comply with all federal, state, and local ordinances for the control and abatement of noise as approved by local jurisdictions.

B. Noise Restrictions: The construction, demolition, alteration or repair of any building or the excavation of streets and highways creating elevated noise levels between the hours of nine o'clock (9:00) P.M. and six o'clock (6:00) A.M. on weekdays and six o'clock (6:00)

P.M. and eight o'clock (8:00) A.M. on weekends is prohibited. Should the Contractor or subcontractor's anticipate construction operations which will conflict with these restrictions the Contractor shall promptly notify the Architect and Owner's Representative.

C. Contractor shall conduct construction operations in a manner to cause the least annoyance to the residents in the vicinity of construction operations.

D. All construction activities creating elevated noise levels in residential areas shall be limited to normal daytime hours (6:00 A.M. to 9:00 P.M.)

E. It shall be prohibited for sirens associated with anti-theft or anti-intruder alarm systems to sound for more than fifteen (15) minutes at any single time. Therefore, every siren shall have a reset device, which causes an automatic shut-off after the siren has sounded for fifteen (15) continuous minutes.

1.4 LIGHTING

A. Lighting used for night Work shall be equal to, but not less than, two (2) sets of portable flood lights, each having two (2) adjustable, 400-watt lamps.

B. All lighting apparatus used to illuminate track-side structures shall receive necessary power from sources other than the hi-rail mounted vehicle's battery or charging system.

C. All electrical generating equipment shall be subject to local codes concerning allowable decibel limits (see also NOISE CONTROL in this section).

1.5 DUST CONTROL

A. Contactor shall provide positive methods and apply dust control materials to minimize raising dust from construction operations such as construction vehicle movement, excavation, grading, and fill activities, and provide positive means to prevent air-borne dust from dispersing into the atmosphere. The Contractor shall control dust levels by wetting dirt access roads and the Work site periodically during times when dust levels become elevated.

B. Contractor shall, as appropriate, clean truck tires as they leave construction sites, and periodically use street cleaners in the vicinity of Work sites.

C. Contractor shall cover the loads of haul trucks.

1.6 WATER CONTROL

A. Comply with project Storm Water Pollution Prevention Plan (SWPPP) and provide soil erosion and sediment control conforming to requirements of local soil conservation district. Provide methods to control surface water to prevent damage to the Project, the site and adjoining properties: Perform fill, grading and ditching operations to direct surface drainage away from excavations, pits, tunnels and other construction areas. Direct drainage waste to a proper run-off point.

B. Provide, operate and maintain hydraulic equipment of adequate capacity to control surface water.

C. Dispose of drainage water in a manner to prevent flooding, erosion, and other damage to any portion of the site and to adjoining areas.

1.7 PEST CONTROL

A. Provide pest control as necessary to prevent infestation of construction or storage areas.

1. Employ methods and use materials to control pests and not adversely affect conditions at the site or adjoining properties.
2. Should the use of pesticides be considered necessary, submit an informational copy of the proposed program to the Architect with a copy to the Owner. Clearly indicate:
    a. The area or areas to be treated
    b. The pesticides to be used, with a copy of the manufacturer's printed instructions
    c. The pollution preventative measures to be employed.

B. Before deep foundation work has been completed, retain a local exterminator or pest-control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Engage this pest-control service to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

C. The use of any rodent pesticide shall be in full accordance with the Manufacturer's printed instructions and recommendations and shall comply with all federal, state, and local laws governing the use and application.

1.8 DEBRIS CONTROL

A. Maintain all areas under the Contractor's control free of extraneous debris.

B. Initiate and maintain a specific program to prevent accumulation of debris at Work site, storage, and parking areas or along access roads and haul routes. Waste materials and debris generated during construction Work on the project shall be properly disposed of in approved sanitary landfills by the Contractor in order to maintain construction areas free of debris.

1. Provide containers for deposit of debris as necessary.
2. Prohibit overloading of trucks to prevent spillage on access and haul routes.
3. Provide periodic inspection of traffic areas to enforce requirements.

C. Household debris from demolition and site clearing shall be packed into roll-off containers and sent to landfill. Waste tires shall be cut into four parts each, deposited in separate roll-off containers and disposed of at a landfill. Waste shingles shall be assumed to contain asbestos materials and therefore, shall be wetted and placed in bags in separate roll-off containers and legally disposed of.

D. Schedule periodic collection and disposal of debris as necessary to comply with specified requirements.

1. Provide additional collections and disposals of debris whenever the periodic schedule is inadequate to prevent accumulation.

2. Disposal of debris shall be in accordance with applicable federal, state and local laws.

1.9 POLLUTION CONTROL

A. Provide methods, means and facilities as required to prevent contamination of soil, water, and atmosphere by the discharge of noxious substances from construction operations: Comply with the requirements of the Storm Water Pollution Prevention Plan (SWPPP) prepared and approved by IEPA for the project.

B. Provide equipment and personnel, perform emergency measures required to contain any spillage and to remove contaminated soils or liquids: Excavate and dispose of any contaminated soil off-site, and replace with suitable compact fill and topsoil.

C. Take special measures to prevent harmful substances from entering public waters: Prevent disposal of wastes, effluents, chemicals and other such substances into adjacent streams and sanitary and storm sewers.

D. Provide systems for control of atmospheric pollutants:

1. Prevent toxic concentrations of chemicals,
2. Prevent harmful dispersal of pollutants into the atmosphere.

E. Pollution control shall be performed in accordance with all applicable federal, state and local laws.

1.10 EROSION CONTROL

A. Plan and execute construction and earthwork by methods that control surface drainage from cuts and fills and from borrow and waste disposal areas to prevent erosion and sedimentation.

1. Hold the areas of bare soil exposed at one time to a minimum.

2. Provide temporary control measures such as berms, dikes, drains and sediment basins.

B. Periodically inspect earthwork to detect any evidence of the start of erosion. Maintain temporary control measures and apply corrective measures as required, to control erosion.

C. The Contractor shall be responsible for complying with the Storm Water Pollution Prevention Plan (SWPPP) in accordance with Illinois Environmental Protection Agency (IEPA) requirements. The plan will assure compliance with the terms and conditions of the National Pollution Discharge Elimination System (NPDES) Storm Water permit and

the Clean Water Act. The Contractor shall also be responsible for submitting a Notice of Intent (NOI) in accordance with the regulations of the NPDES permit.

1.11 VIBRATION CONTROLS

A. Contractor shall consider using drilled piers in areas where the soil and rock conditions are suitable for the use of this type of foundation system. Contractor shall also consider using vibratory hammer pile driving equipment that operates with less noise and vibration than the traditional impact hammer equipment.

1.12 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

1.13 SAFETY AND SECURITY

A. Where required by construction operations, the Contractor shall provide temporary travel corridors with accessible pedestrian routes to facilitate pedestrian movements through construction areas and temporary traffic signals and signs shall be used to maintain safe travel patterns.

B. Proper cautionary signs, barriers and fencing shall be used to keep the public from entering construction zones.

C. Where necessary, security personnel shall be employed to protect the public from dangerous construction activities.

D. Underpinning and piling of existing structures shall be used to avoid settlement resulting from excavation and related construction activities.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 50 01

SECTION 01 52 01 - CONSTRUCTION FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Section 01 10 00 “Project Summary – Bid Packages / Schedule” for bid package coordination, responsibilities, and project schedule.

1.2 BASE BID

A. Temporary Electrical Services

B. Temporary Heat

C. Temporary Water Service

D. Temporary Sanitary Facilities

E. Protection of Installed Work

F. Security

G. Progress Cleaning

H. Contractor’s Field Offices and Sheds

I. Sidewalks, Curbs, Streets and Thoroughfares

J. Protection of Sewers and Drainage

K. Noise, Dust and Air Quality Control

L. Moisture and Mold Control

M. Operation, Termination and Removal

1.3 TEMPORARY ELECTRICAL SERVICE (BID PACKAGE 07)

A. Provide and maintain temporary power equipment for duration of construction activities until building service power is operational and available for construction use. Fees to be paid by Owner.

1.4 TEMPORARY HEAT (NOT INCLUDED IN BASE BID)

A. Provide and pay for heat devices and fuel, as required in the Contract Documents, to maintain specified conditions for construction operations.

1.5 TEMPORARY WATER SERVICE (BID PACKAGE 05)

A. Provide and maintain quality water service required for construction operations. Potable water shall be approved by local health authorities.

1.6 TEMPORARY SANITARY FACILITIES (BY OWNER)

A. Provide and maintain required sanitary facilities and enclosures: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

1.7 PROTECTION OF INSTALLED WORK (ALL BID PACKAGES)

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products.

C. Control activity in immediate Work area to minimize damage.

D. Provide protective coverings to facilities subject to damage caused by the elements.

1.8 SECURITY (ALL BID PACKAGES)

A. Provide security and facilities to protect Work from vandalism and theft.

1.9 PROGRESS CLEANING (ALL BID PACKAGES)

A. Maintain areas free of waste materials, debris and rubbish. Maintain site in a clean and orderly condition.

B. Remove waste materials, debris, and rubbish from site periodically or within forty-eight (48) hours after receiving a formal request to do so from the PM and dispose of appropriately off-site.

1.10 CONTRACTOR’S FIELD OFFICES (BY CONSTRUCTION MANAGER)

A. Size: For Contractor’s needs

B. Other Furnishings: Contractor’s option

C. Provide space dedicated for A/E and Owner use.

D. Provide space sufficient for site meetings as required by other sections.

1.11 SIDEWALKS, CURBS, STREETS AND THOROUGHFARES (ALL BID PACKAGES)

A. Maintain existing areas affected by construction. Promptly repair breaks, potholes, low areas, and other deficiencies, and restore to original condition.

B. Maintain access to all existing facilities (i.e., residences, businesses, public facilities, etc.)

C. Clean and maintain sidewalks, curbs, streets, thoroughfares free of dirt, mud, water and construction debris.

1.12 PROTECTION OF SEWERS AND DRAINAGE (ALL BID PACKAGES)

A. Take adequate measures to prevent impairment of operations of existing sewer systems.

B. Prevent construction material, soil, and debris from entering sewer and sewer structure.

C. Repair and restore damages to existing sewers caused by construction activities.

D. Maintain drainage/flowlines.

1.13 NOISE, DUST AND AIR QUALITY CONTROL (ALL BID PACKAGES)

A. Construction equipment shall be equipped with mechanical devices, provided with barriers or shields, and operated in a manner that minimizes noise and dust.

B. Compressors shall be equipped with silencers on intake lines.

C. Internal combustion engines shall be equipped with silencers or mufflers on exhaust lines.

D. Storage bins and hoppers shall be lined with material that will deaden sounds.

E. Noise, dust, and air quality shall be controlled in accordance with Section 01 50 01, Temporary Facilities and Controls, and Section 00 53 00, General Conditions.

1.14 MOISTURE AND MOLD CONTROL (ALL BID PACKAGES)

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.

2. Keep interior spaces reasonably clean and protected from water damage.

3. Periodically collect and remove waste containing cellulose or other organic matter.

4. Discard or replace water-damaged material.

5. Do not install material that is wet.

6. Discard, replace, or clean stored or installed material that begins to grow mold.

7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

1.15 OPERATION, TERMINATION, AND REMOVAL (ALL BID PACKAGES)

A. Install project signage as required.

B. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

C. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the property of Contractor. The Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Section 01 77 00 Closeout Procedures.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 52 01

SECTION 01 55 13 - TEMPORARY ACCESS ROADS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 BASE BID (BID PACKAGE 01)

A. Materials

B. Preparation

C. Access Roads

D. Parking

E. Existing Streets and Parking

F. Maintenance

G. Removal, Repair

PART 2 - PRODUCTS

2.1 MATERIALS

Temporary construction: Contractor’s option

PART 3 - EXECUTION

3.1 PREPARATION

Clear access roads and parking areas. Provide surface drainage of facilities and adjacent areas.

3.2 ACCESS ROADS

A. Obtain permission to construct access roads from Owner and coordinate with site conditions. Construct temporary all-weather access roads away from public thoroughfares to serve construction area. Roads shall have a width and load-bearing capacity to provide unimpeded traffic for construction purposes, by way of designated easements.

B. Extend and relocate access roads as Work progress requires. Provide detours, as necessary, to unimpeded traffic flow. Contractor’s vehicles shall not cross existing

railroad tracks except at designated crossings. Tracked vehicles shall not be used to traverse along the tracks.

C. Location must be approved by the Owner prior to construction.

3.3 PARKING

A. Arrange for temporary parking areas to accommodate use by construction personnel.

B. When on-site space is not adequate, provide additional off-site parking. C. Location must be approved by the Owner.

3.4 EXISTING STREETS AND PARKING AREAS

A. Existing on-site streets and driveways may not be used for construction traffic unless approved by the Owner. Track vehicles are not allowed.

B. Existing parking facilities may not be used by construction personnel unless prior approval is obtained from the Owner.

C. Do not allow heavy vehicles or construction equipment in parking areas.

3.5 MAINTENANCE

A. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

B. Maintain existing and permanent paved areas used for construction.

Promptly repair breaks, potholes, low areas, standing water and other deficiencies to maintain paving and drainage in original or specified condition.

3.6 REMOVAL, REPAIR

A. Remove temporary materials and construction at Substantial Completion.

B. Restore to original condition all existing facilities damaged by use.

END OF SECTION 01 55 13

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:
   1. Section 01 25 00 "Substitution Procedures" for requests for substitutions.
   2. Section 01 42 00 "References" for applicable industry standards for products specified.
   3. Section 01 10 00 “Project Summary – Bid Packages / Schedule” for bid package coordination and project schedule.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Section 01 33 00 "Submittal Procedures."
b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Where products are accompanied by the term "as selected," Architect will make selection.
4. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturers:

    a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 66 19 - PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 BASE BID (ALL BID PACKAGES)

A. Products

B. Transportation and handling

C. Storage and protection

1.3 PRODUCTS

A. Products: New material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

B. Do not use materials and equipment removed from existing premises, except as noted on drawings.

C. Provide interchangeable components of the same manufacturer, for similar components.

1.4 TRANSPORTATION AND HANDLING

A. Submit procedures for receiving and handling products to prevent damage.

B. Transport and handle products in accordance with manufacturer's instructions.

C. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

D. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement or damage.

1.5 STORAGE AND PROTECTION

A. The Contractor shall maintain all contract materials, products, equipment and installations during construction and suspension of work, if any, until the issuance of

certificate of final completion for the entire contract. This maintenance shall constitute continuous and effective work performance, as required, with adequate equipment and labor, as well as security forces to the end that all parts of the Work be kept in safe and satisfactory condition at all times. The Contractor shall also provide, at no additional cost to the Owner, the necessary temporary and permanent utilities including gas, electric and water for all contract work for the duration of the Contract.

B. Particular attention shall be paid to protection against vandalism and theft, weather action and drainage both permanent and temporary at all times. The Contractor shall use all reasonable precautionary measures to avoid damage or loss that might result from accumulations and concentrations of drainage water and material carried by such water and such drainage shall be diverted or removed when necessary to protect the Work and work area. All electrical/mechanical parts and equipment shall be protected against weather, duly attended to, and maintained with grease, oil, cleaning, and as appropriate in satisfactory condition at all times, including after testing, until the final acceptance of the entire work. Contractor shall repair or replace at no cost to the Owner, any work that is damaged or deteriorated due to Contractor's failure to comply with this paragraph.

C. Submit procedures for transporting, storing and protecting materials, products, equipment and installations.

D. Store and protect materials, products, equipment, and installations in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive materials, products, equipment, and installations in weather-tight, climate-controlled enclosures. Storage sensitive material so material first in, is first out.

E. For exterior storage of fabricated materials, products, equipment and installations, place on sloped supports, above ground.

F. Provide off-site storage and protection when site does not permit on- site storage and protection.

G. Cover materials, products, equipment, and installations subject to deterioration with impervious sheet covering. Provide heat and ventilation to avoid condensation.

H. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

I. Provide equipment and personnel to store materials, products, equipment, and installations by appropriate methods to prevent soiling, disfigurement, and damage.

J. Arrange storage of materials, products, equipment, and installations to permit access for inspection. Periodically inspect to assure materials, products, equipment and installations are undamaged and are maintained under specified conditions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 66 19

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.

B. Related Requirements:
1. Section 01 33 00 "Submittal Procedures" for submitting surveys.
2. Section 01 10 00 “Project Summary – Bid Packages / Schedule” for bid package coordination and project schedule.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

B. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

3.7 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 91 01 "Commissioning."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Disposing of nonhazardous demolition and construction waste.
   2. Construction Manager to supply dumpsters for use for typical construction waste throughout the project.
   3. Items below will need to be disposed in dumpsters provided by Bid Package Contractors:
      a. Excavation Spoils of any kind
      b. Concrete
      c. Masonry – CMU, Brick, Stone, etc.
      d. All Roofing Materials including sheathing
      e. Paint
   4. See Section 01 10 00 “Project Summary – Bid Packages / Schedule” for additional information and requirements per Bid Package.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 INFORMATIONAL SUBMITTALS

A. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

B. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

C. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

D. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management.
2. Review procedures for periodic waste collection and transportation to disposal facilities.
3. Review waste management requirements for each trade.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

3.2 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 01 74 19

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 01 73 00 "Execution" for progress cleaning of Project site.
2. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
4. Section 01 79 00 "Demonstration and Training" for requirements for instructing Owner's personnel.
5. Section 01 91 01 “Commissioning” for special commissioning requirements.
6. Section 01 10 00 “Project Summary – Bid Packages / Schedule” for bid package coordination and project schedule.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
2. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
3. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.

4. Submit test/adjust/balance records.
5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."
6. Advise Owner of changeover in heat and other utilities.

7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 01 29 00 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in the following format:

    a. MS Excel electronic file. Architect will return annotated file.

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Remove tools, construction equipment, machinery, and surplus material from Project site.
c. Remove snow and ice to provide safe access to building.
d. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
e. Sweep concrete floors broom clean in unoccupied spaces.
f. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
g. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
h. Remove labels that are not permanent.
i. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
j. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
k. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
l. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.

m. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

n. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

    a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Operation manuals for systems, subsystems, and equipment.
3. Product maintenance manuals.
4. Systems and equipment maintenance manuals.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Section 01 78 39 "Project Record Documents" for record document descriptions.
3. Section 01 79 00 “Demonstration and Training” for training and documentation required.
4. Section 01 91 01 “Commissioning” for third party reviewer documentation.
5. Section 01 10 00 “Project Summary – Bid Packages / Schedule” for bid package coordination and project schedule.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

   a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
   b. Enable inserted reviewer Comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: 3 Each: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Operating standards.

3. Operating procedures.
4. Operating logs.
5. Wiring diagrams.
6. Control diagrams.
7. Piped system diagrams.
8. Precautions against improper use.
9. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to

identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Section 01 78 39 "Project Record Documents."

F. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Requirements:

1. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
2. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Section 01 79 00 “Demonstration and Training”
4. Section 01 91 01 “Commissioning”
5. Section 01 10 00 “Project Summary – Bid Packages / Schedule”

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.
2. Number of Copies: Submit copies of record Drawings as follows:

a. Initial Submittal:

1) Submit one paper-copy set(s) of marked-up record prints.
2) Submit PDF electronic files of scanned record prints and one of file prints.
3) Submit record digital data files and one set(s) of plots.
4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit three paper-copy set(s) of marked-up record prints.

2) Submit PDF electronic files of scanned record prints and three set(s) of prints.
3) Print each drawing, whether or not changes and additional information were recorded.

c. Final Submittal:

1) Submit one paper-copy set(s) of marked-up record prints.
2) Submit record digital data files and three set(s) of record digital data file plots.
3) Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy of each submittal.

D. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.

d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Work Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.

a. See Section 01 33 00 "Submittal Procedures" for requirements related to use of Architect's digital data files.
b. Architect will provide data file layer information. Record markups in separate layers.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
3. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
3. Note related Change Orders and record Drawings where applicable.

B. Format: Submit record Specifications as paper copy.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as paper copy.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, Introduction, and scope, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.
d. Name of Contractor.
e. Date of video recording.

2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
4. At completion of training, submit complete training manual(s) for Owner's use in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor are delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.

l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.

1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

a. Name of Contractor/Installer.

b. Business address.
c. Business phone number.
d. Point of contact.
e. E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

a. Produce segments to present a single significant piece of equipment per segment.
b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

END OF SECTION 01 79 00

SECTION 01 91 01 - COMMISSIONING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Description – Base Bid (BID PACKAGES 05, 06, AND 07)

B. Commissioning Process

C. Related Work

1.2 DESCRIPTION

A. The Bid Package 05, 06, and 07 Contractors will be required to contract and fully coordinate a certified third-party Commissioning Authority (CxA). Costs of this to be included in General Contractors Base bid for this project. Scope of this section to be included in Base bid for this project.

B. Commissioning: Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the Owner's operational needs. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing, adjusting, and balancing, performance testing, and training.

C. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1. Verify applicable equipment and systems are installed according to the Owner's project requirements, manufacturer's recommendations, and industry accepted minimum standards.
2. Verify applicable equipment and systems receive adequate operational checkout by installing contractors.
3. Observe and document proper performance of equipment and systems.

D. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

E. Abbreviations. The following are common abbreviations that may be used in the specifications and the Commissioning Plan.

1. A/E Architects and Engineers
2. BOD Basis of Design
3. Cx Commissioning
4. CIL Construction Issues Log
5. CxA Commissioning Authority

6. CxS Commissioning Specialist
7. CM Construction Manager
8. TCC Temperature Controls Contractor
9. DB/C Design Build Contractor
10. EC Electrical Contractor
11. FOR Field Observation Report
12. FPT Functional Performance Test
13. GC General Contractor
14. IST Integrated Systems Test
15. MFR Manufacturer
16. MC Mechanical Contractor
17. O&M Operation and Maintenance
18. OPR Owner's Project Requirements
19. PC Plumbing Contractor
20. Subs Subcontractors to General
21. TAB Test, Adjust & Balance Contractor

1.3 COMMISSIONING PROCESS

A. Minimum Items to be Commissioned: Mechanical Systems and Controls, Domestic Water System, Electrical Lighting Controls.

B. Commissioning Process. The project will be commissioned to meet IECC 2018 requirements.

1.4 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All the following sections apply to the Work of this section.

1. Section 01 78 23 - Operations and Maintenance
2. Section 01 79 00 - Demonstration and Training

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Contractor shall provide all test equipment necessary to fulfill the testing requirements of this Division, including Commissioning noted in other areas of specifications.

B. All standard testing equipment required to perform startup, initial checkout, and functional performance testing shall be provided by the Division Contractor. If required, two-way radios, ladders and/or man-lifts shall be provided by the General Contractor or applicable subcontractor.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the related specifications. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged shall be replaced. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 COORDINATION

A. General Contractor to fully coordinate all disciplines relating to these requirements.

B. Coordinate with the Commissioning Authority (CxA) during the construction phase of the Project. The CxA will develop a Cx Plan to clarify the Commissioning process. Refer to the individual division commissioning specifications for a listing of the equipment and systems to be tested.

3.2 EXECUTION

A. The Commissioning Process requires efficient and effective communication among all trades, the design team, the contractors, the vendors, the Owner, and the Commissioning Authority. To facilitate the transition from one activity to the next and to prove system readiness for functional testing; the Commissioning Authority requires documentation showing compliance with the project requirements as well as providing evidence of conformance with manufacturer's recommendations. The following shall be documented and submitted for review and acceptance by the Commissioning Authority in a timely manner for each commissioned piece of equipment or system:

1. Startup reports filled out by a factory authorized representative as required by the project technical specifications.
2. Field quality control test reports as required by the project technical specifications.
3. Building automation system "point to point" reports.
4. Testing, adjusting, and balancing reports (air and hydronic system) as required by the project technical specifications.
5. Building automation system graphics.
6. Contractor completed Functional Performance Test documenting that, at a minimum "one of", for each functional test has been completed without deficiency.
7. Operating and Maintenance manual as required by the project technical specifications and also meeting the requirements of IECC 2018 C408.

B. These documents will be reviewed and accepted by the Commissioning Authority, with concerns and deficiencies tracked in the Construction Issues Log. Commissioning Authority review of these documents is independent of any Architect/Engineer of Record review and approval as required elsewhere in the project technical specifications.

C. Functional Performance Test procedures document conformance with the Owner's Requirements, establish a baseline for equipment and system performance, and are critical tools for troubleshooting by O&M staff during occupancy.

1. The Commissioning Authority will develop the Functional Performance Tests based on the Owner's project requirements, the design construction documents, and approved submittals.
2. The Commissioning Authority will develop DRAFT copies for the Commissioning Team to review and provide comments.
3. The Commissioning Authority will incorporate comments from the team as required and issue FINAL copies that the contractors will implement as required in this section, Paragraph 3.2A.7.
4. The Commissioning Authority will witness and document final Functional Performance Testing.
5. If Functional Performance Tests fail or deficiencies are found that do not allow the Commissioning Authority to complete the testing, the deficiency will be documented in the Commissioning Actions Log.

D. In the event functional testing cannot be completed due to Contractor negligence in completing and submitting documentation listed in Paragraph 3.2A or due to Contractor misrepresentation a system is ready for testing, a retesting charge will be submitted by the Commissioning Authority. Retesting charges to satisfactorily complete the Functional Performance Testing shall include labor and reimbursable expenses. These will be assessed to the Owner, wholly transferrable to the General Contractor or Construction Manager at the discretion of the Owner.

END OF SECTION 01 91 01

SECTION 024113 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of a building or structure.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.
3. Section 070150 “Preparation for Re-Roofing” for roof coordination and requirements.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.

C. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and for noise control. Indicate proposed locations and construction of barriers.

C. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure the Owner's building manager's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Coordination of Owner's occupancy requirements.

D. Predemolition Photographs or Video: Submit before Work begins.

E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.8 FIELD CONDITIONS

A. Owner will not occupy portions of building immediately adjacent to selective demolition area.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate, and measure the nature and extent of conflict. Promptly submit a written report to Architect.

D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.

1. Comply with requirements specified in Section 013233 "Photographic Documentation."
2. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Building manager will arrange to shut off indicated services/systems when requested by Contractor.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    e. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated on drawings and as written. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
4. Maintain adequate ventilation when using cutting torches.
5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
7. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

3.4 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

C. Roofing: Remove no more existing roofing than needed to make the pipe connections detailed on the drawings. The built-up asphalt roofing felts contain asbestos. Cut out and carefully remove the built-up asphalt felts in the area needed, properly bag, and dispose of according to the requirements of the EPA.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024113

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. All items required for executing and completing the cast-in-place concrete work and related work shown on the drawings or specified herein. Work shall include installation of items furnished in other sections of these specifications.

B. Concrete paving, walks curbs are specified in Division 3 or 32.

C. Structural notes indicated on the drawings regarding cast-in-place concrete shall be considered a part of this specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.

B. Section 03 10 00 - Concrete Formwork.

C. Section 03 20 00 - Concrete Reinforcement.

D. Section 03 38 10 - Unbonded Post-Tensioned Concrete.

E. Section 05 31 00 - Steel Deck.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified. Where any provision of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

1. ACI 117 - Specification for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 302.1R - Guide to Concrete Floor and Slab Construction.
4. ACI 302.2R - Guide for Concrete Slabs that Received Moisture-Sensitive Flooring Materials.
5. ACI 303.1 - Standard Specification for Cast-in-Place Architectural Concrete.
6. ACI 304R - Guide to Measuring, Mixing, Transporting, and Placing Concrete.
7. ACI 305.1 - Specification for Hot Weather Concreting.
8. ACI 306.1 - Guide to Cold Weather Concreting.
9. ACI 309R - Guide for Consolidation of Concrete.
10. ACI 318 - Building Code Requirements for Structural Concrete.
11. ACI 347R - Guide to Formwork for Concrete.
12. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
13. ASTM C33 - Standard Specification for Concrete Aggregates.

14. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
15. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
16. ASTM C88 - Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
17. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
18. ASTM C131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
19. ASTM C138 - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
20. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
21. ASTM C150 - Standard Specification for Portland Cement.
22. ASTM C157 - Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete
23. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
24. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
25. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
26. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
27. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
28. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
29. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
30. ASTM C1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
31. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic Cement Concrete.
32. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
33. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
34. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
35. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.
36. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
37. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
38. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
39. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
40. Concrete Reinforcing Steel Institute (CRSI) - Manual of Standard Practice.

1.4 SAMPLING AND TESTING REQUIREMENTS

A. Maintain records verifying materials used are of the specified and accepted types and sizes and are in conformance with the requirements of the Contract Documents.

B. Use of testing services will not relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents.

C. Take samples of fresh concrete at the job site for each mix design placed each day. Sampling and testing shall be done after the final addition and proper mixing of any water or admixtures that are added on site.

1. Personnel and testing equipment shall meet the requirements of ASTM E329.
2. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
3. Testing Frequency: Obtain at least one composite sample for each 150 cu. yd. or 5,000 sq. ft. of surface area, whichever is less or fraction thereof of each concrete mixture placed each day.

    a. On a given project, if the total volume of concrete is such that the frequency of testing required above would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.

4. A strength test shall be the average of the strengths of two 6x12 inch or three 4x8 inch cylinders made from the same sample of concrete and tested at 28 days.

D. For each sample of fresh concrete, perform the following duties:

1. Measure and record slump in accordance with ASTM C143.
2. Measure and record temperature in accordance with ASTM C1064.

    a. Provide one test hourly when air temperature is 40°F and below and when 80°F and above, and one test for each composite sample.

3. Measure and record air content by volume in accordance with either ASTM C231 or ASTM C173.

    a. Wet cure specimens for a period of seven (7) days (including the period of time the specimens are in the mold). Wet cure may be achieved through storage in a moist cabinet or room in accordance with ASTM C511, or through storage in lime-saturated water.
    b. Slump of concrete for testing shall match job requirements and need not be limited to the restrictions as stated in ASTM C157.
    c. Report results in accordance with ASTM C157 at 0, 7, 14 and 28 days of drying.

4. Mold three 6x12 inch or four 4x8 inch cylinders (laboratory cylinders) in accordance with ASTM C31 to be laboratory-cured. Protect from moisture loss and maintain at 60°F to 80°F for 24 to 48 hours before moving. Deliver cylinders to testing laboratory for curing and testing.
5. Mold one cylinder (field cylinder) in accordance with ASTM C31 to be field-cured. Field cylinder shall be placed as near as possible to the in-place concrete from which it was taken, protected, and cured in the same manner. Deliver field-cured cylinder to testing laboratory, and measure and record compressive strength in accordance with ASTM C39. Field cylinder shall be used to determine if concrete footings, walls, or piers have reached the required compressive strength for steel erection to begin.

E. Measure and record compressive strength in accordance with ASTM C39 for laboratory cylinders. Test one laboratory cylinder at 7 days and all other cylinders at 28 days. Acceptance is based on the average of the two 6x12 inch or three 4x8 inch laboratory cured 28-day tests. Notify Architect in the event strength levels do not meet the acceptance requirements of ACI 318.

1. Any additional cylinders molded for Contractor to have a compressive strength test done before seven days shall be at the Contractor's expense.

F. Prepare and submit test reports to the[Architect][, Engineer][, Contractor][and][Supplier]. Reports shall be completed and furnished within 48 hours of testing. Refer to description in Submittals.

G. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

H. Should the strength of any grade of concrete for any portion of work, as indicated by molded test cylinders, fall below the minimum 28-day compressive strength specified on the drawings, upon approval of the Structural Engineer, the concrete supplier shall adjust the concrete mix for remaining portion of construction so that the resulting concrete meets the minimum strength requirements.

1.5 SUBMITTALS

A. Concrete Materials: Submit information on concrete materials as listed below.

1. Cementitious materials: Submit type, class, producer name, and certification not more than 90 days old of compliance with applicable ASTM standard.
2. Aggregates: Submit type, pit or quarry location, producer name, gradations, specific gravity, water content, and certification not more than 90 days old.
3. Admixtures: Submit product data sheet. Product data shall include: dosages and performance data, brand names, producers, chloride ion concentrations, and certifications of compliance with applicable ASTM standard. Certifications shall not be more than 90 days old.
4. Water: Submit name of source.

B. Product Data: Prepare and submit product and performance data for materials and accessories, including patching compounds, joint systems, curing compounds, finish materials, and other concrete related items.

C. Testing Agency Qualifications: When requested, the proposed testing agencies shall submit data on qualifications for acceptance.

D. Concrete Mix Design:

1. Concrete mix design submittals shall be submitted to the Structural Engineer for review and approval at least 14 days prior to placing concrete.
2. Mix design shall be certified by a registered Civil Engineer licensed in California.
3. Obtain Structural Engineer approval for each mix design prior to use, including new mix designs required to be prepared should there be a change in materials being used.
4. Submit concrete mixture proportions and characteristics for each concrete mix. Include standard deviation analysis or trial batch data with mix design. Submit historical field test data to demonstrate the average compressive strength for approval. Concrete mix proportions, materials, and handling methods for field test data or trial batches shall be the same as used for the work. Include the following information for each mix design:

    a. Water/cementitious materials ratio.
    b. Slump per ASTM C143
    c. Air content per ASTM C231 or ASTM C173
    d. Unit weight of concrete per ASTM C138
    e. Compressive strength at 28 days per ASTM C39
    f. Shrinkage (length change) as measured in accordance with ASTM C157 with the modifications included in Section 1.3.

5. If trial batches are used, submit representative samples of each proposed ingredient to independent testing laboratory for use in preparation of mix design.
6. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Indicate amounts of mix water to be withheld for later addition at Project site.
7. Provide a record copy of the final mix designs and test results to the testing agency prior to commencement of the concrete work.

E. Concrete Finish Shop Drawings: Submit drawings indicating type of finish to be used at each location.

F. Slab-on-Grade Joint Layout: Submit drawings for proposed slab-on-grade control joint and construction joint layout for approval.

G. Construction Sequence Submittal: Contractor shall submit an elevated slab construction sequence indicating construction joints and the pour sequence.

H. Test Reports: Submit laboratory test reports for concrete materials, mix design, compressive strength, slump, air content, and temperature. Each report shall indicate date of sampling, date of test, mix design, and location of concrete in structure.

I. Repair Methods: When stains, rust, efflorescence, and surface deposits must be removed, submit the proposed method of removal.

J. Certificates: Submit written certification regarding the design mix from the ready-mix supplier and the admixture manufacturer stating all concrete and admixtures do not contain chloride ions in excess of concentrations specified herein.

K. Placement Notification: Notify the Architect at least 24 hours in advance of concrete placement.

L. Adjustments: Submit any adjustments to mixture proportions or changes in materials, suppliers, or sources, along with supporting documentation, during the course of the work.

M. Cold Weather Procedure Submittal: Refer to Cold Weather Concreting article in Part 3 for more information.

N. Record Documents: Accurately record actual locations of embedded utilities and components that are concealed from view.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland Cement: Portland cement shall conform to ASTM C150, Type I Normal, and be a standard brand of Portland cement. Use one brand of cement throughout project, unless approved in writing by the Engineer. Cement, which conforms to ASTM C150 Type II, may be used if it also meets the requirements of ASTM C150 Type I. Cement used in concrete shall be of the same brand and type as the cement used in the concrete represented by the submitted field test data or used in the trial mixtures. Maintain consistent cement color throughout project unless directed otherwise by architectural requirements.

1. Total replacement of Portland cement by supplementary cementitious materials in design mixture shall not exceed 50% (by weight).

B. Supplementary Cementitious Materials

1. Fly Ash: Fly ash shall conform to ASTM C618, Class C or Class F. Replacement of Portland cement by fly ash shall not exceed the following (percentages are by weight):

    a. Concrete Flatwork: 20 percent.
    b. Mass Concrete (more than two feet thick): 50 percent.
    c. All other concrete: 25 percent.
    d. Concrete to be placed in cold weather as defined herein: No fly ash allowed unless the cold weather procedure submitted has compensated for the increased setting time and decreased rate of strength gain due to cold weather and fly ash.

2. Slag Cement: ASTM C989, Grade 100 or 120.

    a. Ground Granulated Blast-Furnace Slag Limit: 50% by weight of total cementitious materials.
    b. In mass concrete more than 2 feet thick, the usage rate may be 80% by weight of total cementitious materials.

3. Silica Fume: ASTM C1240, amorphous silica.

    a. Silica Fume Limit: 10% by weight of total cementitious materials.

4. Combined Fly Ash and Ground Granulated Blast-Furnace Slag:

    a. Supplementary Cementitious Materials Limit: 50% with fly ash not exceeding 25% by weight of total cementitious materials.
    b. In mass concrete more than 2 feet thick: 80% with fly ash not exceeding 50% by weight of total cementitious materials.

5. Combined Fly Ash and Silica Fume:

    a. Supplementary Cementitious Materials Limit: 35% with fly ash not exceeding 25% and silica fume not exceeding 10% by weight of total cementitious materials.

6. Combined Fly Ash, Ground Granulated Blast-Furnace Slag, and Silica Fume:

    a. Supplementary Cementitious Materials Limit: 50% with fly ash not exceeding 25% and silica fume not exceeding 10% by weight of total cementitious materials.

C. Coarse Aggregate for Normal Weight Concrete: Comply with ASTM C33. Provide coarse aggregate from a single source for exposed concrete. Gradations shall be similar to that described in the following table:

COARSE AGGREGATE GRADATIONS							
SIEVE SIZE - PERCENT PASSING							
Grade No.	1-1/2"	1"	3/4"	1/2"	3/8"	No. 4	No. 16
4	90-100 Note 1	20-55	0-15	---	0-5	---	---
57	100	95-100	---	25-60	0-10	0-10	---
67	---	100	90-100	---	20-55	0-10	---
89	---	---	---	100	90-100	20-55	0-10

1. Shall be 100 percent passing the 2" sieve.
2. A maximum of 30% of coarse aggregate may be recycled aggregate for footing and grade beam concrete.

D. Fine Aggregate for Normal Weight Concrete: Comply with ASTM C33. Provide fine aggregate from a single source for exposed concrete. Fine aggregate shall consist of washed sand. Gradations shall be similar to that described in the following table:

FINE AGGREGATE GRADATIONS							
SIEVE SIZE - PERCENT PASSING							
Grade No.	3/8	No. 4	No. 8	No. 16	No. 50	No. 80	No. 100
FA	100	95-100	80-100	50-85	5-30	---	0-10

E. Do not use aggregates containing deleterious substances that could cause spalling on any exterior exposed surface. These include, but are not limited to the following:

1. Organic impurities.
2. Ferrous metals.
3. Soluble salts.
4. Coal, lignite, or other lightweight materials.
5. Soft particles.
6. Clay lumps and friable particles.
7. Cherts of less than 2.40 specific gravity.

F. Water: Mixing water for concrete shall meet the requirements of ASTM C94. Water shall be clean and free from injurious amounts of acids, alkalis, organic materials, chloride ions and oils deleterious to concrete or reinforcing steel.

G. Testing agency shall be given access to plants and stockpiles to obtain samples for testing for compliance with the Contract Documents.

2.2 ADMIXTURES

A. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures. Calcium chloride thiocyanates or admixtures containing intentionally added chlorides are not permitted.

B. Water Reducing Admixture: Material shall comply with ASTM C494, Type A.

1. Acceptable:

a. Master Builders Solutions - MasterPozzolith Series or MasterPolyheed Series.
b. Chemical Company - Eucon WR Series.
c. Sika Chemical Corp. - Plastocrete 161.
d. GRT - Polychem 400 NC.
e. Grace Construction Products - WRDA 82.

C. High Range Water Reducing Admixture (superplasticizer): Material shall comply with ASTM C494, Type F or Type G.

1. Acceptable:

    a. Master Builders Solutions - MasterRheobuild 1000 or MasterGlenium Series.
    b. Euclid Chemical Company - Eucon 37 or Plastol Series.
    c. Sika - ViscoCrete 2100.
    d. GRT - Melchem.
    e. Grace Construction Products - Mira 110.

D. Non-Chloride Accelerator: Material shall comply with ASTM C494, Type C or Type E, and not contain a higher chloride ion concentration than municipal drinking water.

1. Acceptable:

    a. Master Builders Solutions - MasterSet FP 20 or MasterSet AC 534.
    b. Euclid Chemical Company - Accelguard Series.
    c. Sika Chemical Corp. - Sika Rapid-1.
    d. GRT - Polychem HE.
    e. Grace Construction Products - Lubricon NCA.

E. Air Entraining Admixture: Air entraining admixture shall comply with ASTM C260, and be certified by the manufacturer to be compatible with other admixtures to be used.

1. Acceptable:

    a. Master Builders Solutions - MasterAir Series.
    b. Euclid Chemical Company - Air-Mix or AEA Series.
    c. Sika Chemical Corporation - Sika-Aer.
    d. GRT - Polychem VR.
    e. Grace Construction Products - Darex II or Daravair 1000.

F. Admixtures used in concrete shall be the same brand, type, and dosage used in concrete represented by field test data or used in trial mixes.

2.3 CURING PRODUCTS

A. Moisture Retaining Cover

1. Plastic Film: Use [6 mil]<Insert> polyethylene film sheet materials that meet the requirements of ASTM C171.
2. White burlap-polyethylene sheet meeting ASTM C171.
3. Reinforced curing paper complying with ASTM C171.
4. Moisture Retaining Fabric: A naturally colored, non-woven, polypropylene fabric with a 4-mil, non-perforated reflective (white) polyethylene coating containing stabilizers to resist degradation from ultraviolet light. Fabric shall exhibit low permeability and high moisture retention. Acceptable manufacturers and products include:

    a. PNA Construction Technologies, Inc.: Hydracure S16.
    b. PNA Construction Technologies, Inc.: Hydracure M5.
    c. Reef Industries Incorporated: Transguard 4000.

B. Dissipating Resin Curing Compound: Clear, waterborne, membrane-forming curing compound complying with ASTM C309, Type 1, Class B shall be composed of hydrocarbon resins and dissipating agents that begin to break down upon exposure to ultraviolet light and traffic approximately 4 to 6 weeks after application, providing a film that is removable with standard degreasing agents and mechanized scrubbing actions so as to not impair the later addition of applied finishes.

1. Curing compounds used on interior enclosed environments shall be a water-borne product and VOC compliant as required by the U.S. EPA Architectural Coating Rule.

2.4 MISCELLANEOUS MATERIALS

A. Patching Mortar: Non-shrink, non-slump, non-metallic, quick setting.

1. Acceptable manufacturers and products:

a. Euclid Chemical Company - Eucospeed.
b. Master Builders Solutions - MasterEmaco N 424.
c. Adhesive Technologies. - Hard Rok Vertipatch.
d. W.R. Meadows - Speed Crete (Red Line).
e. Dayton Superior - Re-Crete 20 minute.
f. SpecChem - Precast Patch.

B. Cement Grout: Mix 1 part Portland cement, 2-1/2 to 3 parts fine aggregate, and enough water for required consistency. Depending on use, consistency may range from mortar consistency to a mixture that will flow under its own weight. Do not mix more than the amount that can be used within 30 minutes. Retempering is not permitted. Use for leveling, preparing setting pads, beds, construction joints (with liquid bonding admixture) and similar uses. Do not use for grouting under bearing plates or structural members in place.

C. Dry-Pack: Mix 1 part Portland cement, 2 parts fine aggregate, and enough water to hydrate cement and provide a mixture that can be molded with the hands into a stable ball (a stiff mix). Do not mix more than the amount that can be used within 30 minutes.

D. Expansion Joint Material: Preformed, resilient, non-extruding asphalt-impregnated fiber conforming to ASTM D1751. Thickness of expansion joint material shall be 1/2" unless noted otherwise on the drawings.

E. Magnesium phosphate patching cement specially designed for cold weather grouting and anchoring.

1. Acceptable:

a. Master Builders Solutions - MasterEmaco T545.
b. Euclid Chemical Company - Eucospeed MP.

F. Vapor Barrier: ASTM E 1745, Class A, not less than 15 mils thick.

1. Acceptable:

a. Stego Industries, LLC - Stego Wrap.
b. W.R. Meadows, Inc. - Perminator.
c. Raven Industries - Vapor Block.
d. Insulation Solutions - Viper VaporCheck II.

G. Bonding Agent: ["Weld-Crete" manufactured by the Larsen Products Corporation or "Nitobond Acrylic" manufactured by Fosroc Inc.or approved equivalent.

H. Control Joint Filler: Flexible, single-component polyurethane sealant with backer rod compliant with ASTM C 920, Type S, Grade P, Class 25. Apply sealant per manufacturers written recommendations.

1. Acceptable:

a. Dayton Superior - Perma 230 SL.
b. Euclid Chemical Company - Eucolastic I.
c. Master Builders Solutions - MasterSeal SL 1.

I. Control Joint Filler: Two-component, semi-rigid, 100% solid, self-leveling, polyurea joint filler with a Shore A hardness of 90 to 95 per ASTM D 2240. Apply joint filler per manufacturers written recommendations a minimum of 90 days after concrete is poured or return to repair joint separations after shrinkage has occurred utilizing methods recommended by the same manufacturer as the original filler.

1. Acceptable:

a. Metzger McGuire - SPAC-PRO RSF
b. Euclid Chemical Company - EUCO QWIKjoint 300.
c. Master Builders Solutions - MasterSeal CR100

2.5 STRENGTH AND PROPERTIES

A. Concrete Mix Designs: Refer to the drawings for specified compressive strength. Proportion concrete mixes according to the properties in the following table. The concrete supplier may produce a mix at a lower water-cement ratio to allow for adjustment of slump at the site by adding water. The addition of site water shall be in accordance with ASTM C94, and the total water-cement ratio shall not exceed the value specified below.

Class	Coarse Aggregate Gradation	Fine Aggregate Gradation	Range of Slump	Max. w/c	Air Content	Other Requirements
A	57 or 67	FA	1" to 4"	0.40	5% to 8%	
B	57 or 67	FA	1" to 4"	0.45	5% to 8%	
C	57 or 67	FA	1" to 4"	0.50	n/a•	

Class	Coarse Aggregate Gradation	Fine Aggregate Gradation	Range of Slump	Max. w/c	Air Content	Other Requirements
D	57 or 67	FA	4" to 6"	0.50	• n/a	Use water reducing admixture to achieve slump specified
E	4 or 57	FA	1" to 4"	0.50	• n/a	
F	4 or 57	FA	5" to 8"	0.50	n/a•	Use retarder
H	89	FA	5" to 8"	0.50	n/a•	
J	Light-weight	FA	5" max	0.5	4% to 7%	

B. Schedule of Concrete Classes: Provide concrete of the specified class according to the following:

1. Footings: Class E
2. Exterior foundation walls and piers: Class B
3. Interior slabs on grade: Class D
4. Interior slab on metal decks: Class D

C. Slump of Superplasticized Concrete: Concrete containing high-range water reducing admixtures (superplasticizer) shall have 8" maximum slump, unless otherwise approved by Structural Engineer.

D. Compliance with Fire Assembly: All concrete supplied for slab on metal decks shall meet the requirements for a 1 1/2-hour floor construction per UL assembly number D925. Specifically, the concrete must meet the following:

1. Be normal weight with fresh bulk density of 150 pcf.
2. Be vibrated during placement.

E. Water Reducer: Add water reducing admixture or high range water reducing admixtures (superplasticizers) as follows:

1. All pumped concrete.
2. Fiber reinforced concrete.
3. As required for placement or workability.
4. As required by high temperatures, low humidity, or other adverse placement conditions.
5. Concrete with water-cementitious materials ratio below 0.50.

F. No other admixtures shall be used unless approved by Structural Engineer.

G. Chlorides: Admixtures or other ingredients including aggregates containing calcium chloride or more than 0.05% chloride ions by weight shall not be used.

H. Workability: Concrete shall have a workability such that it will fill the forms without voids, honeycombs, or rock pockets with proper vibration without permitting materials to separate or excess water to collect on the surface.

I. Concrete Temperatures: Minimum concrete temperature of fresh concrete varies in relation to average air temperature over a 24-hour period as follows:

1. Air temperature below 0°°F Concrete temperature 70°°F min.
2. Air temperature 0°°F to 30°°F Concrete temperature 65°°F min.
3. Air temperature 30°°F to 50°°F Concrete temperature 50°°F min.
4. Air temperature above 50°°F No minimum temperature
5. The maximum temperature of concrete at the time of delivery shall be 90°°F. When concrete temperature exceeds 90°°F, concrete supplier shall attempt to reduce temperature by shading aggregates and cement and cooling mix water. When these methods fail to reduce the concrete temperature below 90°°F, supplier shall use ice in the water to reduce the concrete temperature. Use set retarding admixtures only when approved in the mix design.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify requirements for concrete cover over reinforcement.

B. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

C. Do not place concrete until data on materials and mix designs have been approved, Architect has been notified, and all other affected trades have coordinated their work.

D. Remove snow, ice, frost, water, mud, and other foreign material from surfaces, reinforcing bars and embedded items against which concrete will be placed.

E. Prepare previously placed concrete by cleaning with sandblasting, steel brush, or water blast to expose aggregate to minimum 1/4" amplitude.

F. Sandblast all existing concrete surfaces older than 28 days against which concrete is to be placed, unless directed otherwise in writing by Architect/Engineer.

3.2 SLABS

A. Slab on Grade:

1. All interior slabs on grade shall have a polyethylene vapor retarder conforming to ASTM E1745. Lap all joints minimum 6" and seal edges with adhesive tape. Fit vapor retarder around utilities and seal with adhesive tape as required. Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions.
2. Refer to drawings for required sub-grade preparation beneath slabs on grade.

3. Where vapor retarder is not used below the slab on grade, wet sub-grade below slab prior to placing concrete. Subgrade shall be moist with no free water and no muddy or soft spots.
4. Saw cut control joints: Cut with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. Control joints shall be located along column lines, with intermediate joints spaced at a maximum distance indicated on the drawings, unless noted otherwise. Control joints shall be continuous, not staggered or offset. Slab panels shall have a maximum length to width ratio of 1.5 to 1. Provide additional control joints at all reentrant or isolated corners formed in the slab on grade. Refer to the drawings for typical control joint detailing.
5. Provide isolation joints around each column, against grade beams, and along foundation walls. Form isolation joints with 1/2" expansion joint material. Extend isolation joint material full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
6. Depress slabs as required for[mats, architectural finishes, pits, and kitchen equipment. Obtain layout and locations from Architect.
7. Verify completion of all under slab work with mechanical and electrical trades before placing slabs.
8. Slope slabs as indicated on the drawings and to provide positive drainage. Slope slab keeping bottom level and varying top. Maintain minimum thickness of concrete as indicated on the drawings. Refer to floor finishes for tolerances.

B. All supported slabs, including slabs-on-steel decking and cast-in-place concrete slabs:

1. Supported slabs have deflections that may cause areas of concrete to have thicknesses greater than indicated on the drawings. Contractor is expected to provide that volume as needed to finish the floor at the specified elevation. If specified floor finish tolerances are not achieved during the concrete floor construction.

C. Embedded Items:

1. The outside diameter of embedded conduit or pipe shall not exceed one-third of the slab thickness in structural slabs, including at crossovers, and shall be placed between the top and bottom reinforcing with a minimum 3" clear cover. Conduit or pipe running parallel to each other shall be spaced at least 8" apart and no more than 2 runs stacked vertically in the slab. Conduit or pipe shall not be embedded in any supported slab less than 6" thick. No embedded conduit or pipe is allowed in any concrete slab-on-steel deck.

3.3 CONSTRUCTION JOINTS

A. Beams: Locate construction joints for beams, joists, and girders in middle 1/3 of span, unless otherwise indicated on the drawings. When a beam intersects a girder at this point, the joint in the girder shall be offset a distance equal to or greater than twice the width of the beam. Make joints perpendicular to the main reinforcement.

B. Slabs: Where slab pour is to receive a subsequent topping or additional concrete, expose aggregate in top surface by brooming in two directions at right angles to each other.

C. Vertical: Locate vertical construction joints in walls andgrade beams not farther than a maximum of 100 feet on center. Coordinate joint locations with architectural design.

D. Reinforcing: Stop all welded wire reinforcement and/or reinforcing at construction joints in slabs on grade and provide dowel bars as detailed. Provide reinforcement at other construction joints as detailed. Roughen and thoroughly clean the surface of the concrete, remove all laitance, and wet the surface before placing new concrete against the joint. Roughen entire surface at construction joints to remove surface paste and expose aggregate.

E. Exposed Surfaces: Locate construction joints only at predetermined locations approved by the Architect and the Structural Engineer.

3.4 CONCRETE PLACEMENT

A. Place concrete as continuously as possible until placement is complete. Do not place against concrete that has attained initial set, except at authorized joints. If, for any reason, concrete pour is delayed for more than 45 minutes, bulkhead off pour at last acceptable construction joint. Immediately remove excess concrete and clean forms.

B. Do not begin to place concrete during periods of rain, sleet, or snow unless adequate protection is provided.

C. No concrete shall be cast onto or against sub-grades containing free water, frost, ice, or snow. If earth at bottom of forms has dried out, rewet so the soil is moist, but free of standing water and mud.

D. Notify the Architect in advance if concrete is to be pumped.

E. Do not place concrete until all reinforcement is in place, forms have been thoroughly cleaned and approval has been given.

F. Do not accept concrete delivered to the job site more than 90 minutes after initial mixing.

G. Concrete from its point of release to mixers, hoppers, or conveyances, shall not be permitted to drop more than 5 feet (10 feet for concrete containing high range water reducers). Deposit concrete directly into conveyances and directly from conveyances to final points of deposit. Sufficient transportation equipment in good working order shall be on hand before work begins. All conveying equipment must be clean and kept clean during concreting operations. Take every possible precaution to prevent segregation or loss of ingredients.

H. Regulate rate of placement so concrete surface is kept level throughout; a minimum being permitted to flow from one area to another. Use tremie heads spaced at approximately 10-foot intervals for placing concrete in walls. Control rate of placement consistent with form design.

I. Deposit concrete in one continuous operation until section being placed has been completed. For slab thicknesses greater than 12 inches, prevent excessive segregation of aggregate and high temperatures in accordance with ACI 304 and ACI 308. Place concrete in wall forms in layers not greater than 12 inches in depth, each layer being compacted by internal vibration before succeeding layer is placed.

J. Place concrete as near as possible to its final position to prevent segregation or loss of materials. Do not use vibrators to transport concrete within forms. Consolidate concrete in walls, columns, beams, and slabs or joist construction thicker than 8" with internal vibrators (8,000 to 12,000 VPM). Slabs less than 8" thick may be consolidated with internal vibrators (9,000 to 13,500 VPM) or vibrating screeds supported on forms, boards, or rails, approved by the Structural Engineer, supplement vibration by forking or spading by hand along surfaces adjacent to forms and construction joints. Be sure an adequate number of operating vibrator units are on hand to properly consolidate quantity of concrete to be placed, including spares for emergency use.

1. Vertically insert and remove handheld vibrators at constant intervals 18 to 30 inches apart. Vibrate concrete the maximum amount and time required for complete consolidation, without segregation, and release of entrapped air bubbles, but in no instance exceed 15 seconds per square foot of exposed surface.

K. Place concrete during daylight hours, unless permitted otherwise by the Structural Engineer.

L. Re-tempering of concrete shall not be permitted. Concrete that has stood more than 15 minutes after leaving the mixer shall be discarded.

M. Exercise care in placing concrete over waterproof membranes, rigid insulation, and/or protection boards to avoid damaging those materials. Report damage immediately, and do not proceed until damage is repaired.

N. Remove loose debris from hardened surfaces of previous pours by sandblasting surfaces and expose clean coarse aggregate firmly embedded in cement matrix.

O. Remove loose debris from hardened surfaces of previous pours, thoroughly wet and slush with a neat cement grout immediately before placing new concrete or apply bonding compound to surface and let dry before placing new concrete.

P. Protect existing concrete work to be exposed to view and other finished materials from damage and staining resulting from concreting operations. Handle concrete carefully to avoid dripping and spillage. Remove spilled concrete from existing surfaces immediately. Covering sills, ledges, and other surfaces with protective coverings may be necessary to protect the work.

Q. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

R. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor rods for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

S. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on the drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.5 CONCRETE SLAB FINISHES AND TOLERANCES

A. Trowel Finish:

1. Screed concrete to an even plane, float, then power trowel the surface.
2. Hand trowel the surface smooth and free of trowel marks. Continue hand troweling until a ringing sound is produced as the floor is troweled.
3. Provide trowel finish as indicated on the drawings and at the following locations:

    a. Concrete floors exposed in finished work unless otherwise indicated.
    b. Slabs to receive curing compounds and sealers.
    c. Slabs to receive resilient flooring or carpet.
    d. Slabs to receive waterproof membranes.

B. Fine Broom Finish:

1. Screed concrete to an even plane, float, then power trowel the surface. Provide fine hair broom finish perpendicular to slope, free of loose particles, ridges, projections, voids, and concrete droppings.
2. Provide fine broom finish as indicated on the drawings and at the following locations:

    a. Stoop slabs.
    b. Raised curbs and walkway areas.
    c. Slabs to receive thin set ceramic tile.

C. Broom Finish:

1. Screed concrete to an even plane and then float. Immediately after concrete has received a floated finish, give the concrete surface a coarse transverse scored texture by drawing a coarse broom across the surface.
2. Provide as indicated on the drawings and at the following locations:

    a. ADA ramp slabs.
    b. Exterior walkway slabs.

D. Floor Finish Tolerances: Floor finish tolerances as measured in accordance with ASTM E1155, Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System (Inch Pound Units), shall be as follows:

Floor Profile Quality Classification	Minimum Flatness Number Required	
	Test Area	Minimum Local F-Number

	Flatness FF	Level FL	Flatness FF	Level FL
Slab on Grade (Office, School)	25	20	15	12
Slab on Grade (General Warehouse)	35	25	21	15
Slab on Grade (Very Flat)	45	35	27	21
Slab on Grade (Super flat)	60	40	36	24
Suspended Slab (Steel frame)	25	N/A	15	N/A

E. Slab Drainage: Finish all concrete slabs to proper elevations to ensure that all surface moisture will drain freely to floor drains, and that no puddle areas exist. Contractor shall bear the cost of corrections to provide positive drainage.

F. Special Tolerances for Concrete Slabs: No abrupt change in vertical elevation of 1/4" or more is acceptable at the interface between slabs and within areas where pedestrian traffic is expected.

3.6 CONCRETE CURING

A. Freshly placed concrete shall be protected from premature drying and excessively hot temperatures.

B. Concrete other than high-early strength shall be maintained above 50°°F and in a moist condition for at least the first 7 days after placement, except when special curing is used. Special curing procedures shall not be used without written permission from the Structural Engineer.

C. High-early strength concrete shall be maintained above 50°°F and in a moist condition until it has reached 2/3 of the specified 28-day compressive strength, but not less than 3 days unless special curing is used with written permission from the Structural Engineer.

D. Formed surfaces shall be cured by leaving the formwork in place during the curing period.

E. Protect concrete from excessive changes in temperature during the curing period and at the termination of the curing process. Changes in the temperature of the concrete shall be as uniform as possible and shall not exceed 5°°F in any one hour or 50°°F in any 24-hour period.

F. Protect concrete from injury from the elements until full strength is developed. Protect from mechanical injury.

G. During cold weather construction, all footings shall be protected from frost penetration until the building is enclosed and temporary heat is provided.

3.7 SLAB CURING

A. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface. Use one of the methods described below.

B. Moisture-Retaining-Cover Curing for Concrete Floors Not Exposed in Final Condition: Cover concrete surface with waterproof sheet material as soon as finishing operations are complete and the concrete is sufficiently hard to be undamaged by covering. The cover shall be placed flat on the concrete surface, avoiding wrinkles. Sprinkle concrete with water as necessary during application of covering. Place in widest practicable width, with sides and ends lapped at least 12 inches, and seal with waterproof tape or adhesive. Verify the concrete is continuously wet under the sheets; otherwise, add water through soaker hoses under the sheets. Weight down covering to prevent displacement. Immediately repair any holes or tears during the curing period using polyethylene sheet and waterproof tape. Curing process shall be maintained for a minimum of 7 days.

C. Curing Compound: Apply uniformly in continuous operation by low pressure spray equipment or roller as soon as finishing operations are complete, free water on the surface has disappeared, and no water sheen can be seen. Follow the manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period. Verify compatibility of the curing compound with paint, finishes, or toppings that require positive bond to the concrete. If curing compound is not compatible with paint finishes or toppings, utilize a dissipating curing compound and remove in accordance with the manufacturer's recommendations.

3.8 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

B. Do not fill joints until construction traffic has permanently ceased.

C. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

D. Install semi-rigid joint filler in saw-cut joints and in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.9 APPLICATION OF FLOOR SEALER - FINISH COAT

A. Give concrete floors, as indicated in the Room Finish Schedule and where exposed in finished Work, a second coat of curing and sealing compound immediately prior to Substantial Completion.

B. Clean floors and apply sealer strictly according to manufacturer's instructions. Dilution and coverage shall be as recommended by the manufacturer. Apply sealer evenly.

3.10 COLD WEATHER CONCRETING

A. Definition: Cold weather shall be defined as a period when for more than three successive days the average daily outdoor temperature drops below 40°F. The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight. When temperatures above 50°F occur during more than half of any 24-hour duration, the period shall not be regarded as cold weather.

B. All cast-in-place concrete work occurring during cold weather shall conform to all requirements of ACI 306.1, "Standard Specification for Cold Weather Concreting", published by the American Concrete Institute, Detroit, Michigan, except as modified by the contract documents or this specification.

C. Planning: The General Contractor, shall have a pre-construction conference to outline the cold weather concreting operations concerning the placing, finishing, curing and protection of the concrete during cold weather. Pre-construction conference shall occur before cold weather is expected to occur.

D. Detailed procedure submittal: Concrete contractor shall prepare and submit for review detailed procedures for the production, transportation placement, protection, curing and temperature monitoring of concrete during cold weather. Include procedures to be implemented upon abrupt changes in weather conditions. Do not begin cold weather concreting until these procedures have been reviewed and approved.

E. Mixing: Concrete flatwork poured in cold weather shall be proportioned to obtain a lower slump to minimize the amount of bleed water during finishing. All bleed water should be skimmed off flatwork prior to troweling. Concrete that will be exposed to cycles of freezing and thawing while saturated should be properly air entrained as outlined in this specification.

F. Protection of Concrete: Cure and protect concrete against damage from freezing for a minimum period of 72 hours, unless approved by the Structural Engineer. The protection period may be reduced according to ACI 306.1 requirements. Concrete contractor shall submit a letter of request to reduce the protection period, by outlining the method used to achieve the reduction per ACI 306.1.

1. When practical for the construction schedule, formwork shall be insulated and remain in place for at least the required protection period.

G. Concrete Temperatures: The minimum temperature of concrete immediately after placement shall be as specified in the following table.

			Mixing Temperatures		
Section Size	Minimum temperature of concrete as placed and maintained during the protection period	Maximum gradual decrease in surface temperature during any 24 hours after the end of the protection.	Above 30°F	0 to 30°F	Below 0°F

Less than 12 in	55°F	50°F	60°F	65°F	70°F
12-36 in	50°F	40°F	55°F	60°F	65°F
36-72 in	50°F	30°F	50°F	55°F	60°F
Greater than 72 in	50°F	20°F	45°F	50°F	55°F

H. Mixing Temperatures: As the ambient air temperature decreases, the concrete mixing temperature shall be increased to compensate for the heat lost in the period between mixing and placement. The concrete supplier shall use one or both of the following methods for increasing the concrete temperature.

1. Heating the mixing water to a temperature necessary to offset the temperature losses during transport. Supplier shall not heat water to temperatures in excess of 140°F, without taking special precautions as outlined in ACI 306.
2. Heating the aggregate with a circulated steam piping system.

I. Temperature measurements: The Contractor shall be responsible for monitoring and recording the concrete temperatures during placement and throughout the protection period.

1. Inspection personnel shall keep a record of the date, time, outside air temperature, temperature of concrete as placed, and weather conditions.
2. Temperature of the concrete and the outside air shall be recorded at regular intervals but not less than twice in a 24-hour period. The record shall include temperatures at several points within the enclosure and on the concrete surface of sufficient frequency to determine a range of temperatures.
3. Inspection agency shall submit the temperature logs to the Architect for permanent job records.

3.11 HOT WEATHER PROTECTION

A. Definition: Hot weather shall be defined as any combination of high ambient temperature, low relative humidity, high winds, and intense solar radiation that leads to higher than usual evaporation. The table below defines low relative humidity based on air temperature. For a given air temperature, if the relative humidity is equal to or less than the specified minimum, provisions for hot weather concreting shall be as follows:

Air Temperature	Minimum Relative Humidity
105°F	90%
100°F	80%
95°F	70%
90°F	60%
85°F	50%
80°F	40%
75°F	30%

B. Scheduling: When hot weather is expected, adjust concrete placement schedules to avoid placing or finishing during the period from noon until 3:00 pm. When possible, slab pours should be delayed until the building is enclosed to protect the concrete from wind and direct sunlight. The construction schedule shall account for 7-day moist curing period.

C. Mixing: Concrete supplier shall adjust mix designs and admixtures to minimize slump loss. Concrete shall be mixed at a water-cement ratio, which is lower than the specified maximum, to allow for the adjustment of slump by addition of water in the field. Water reduction shall be accomplished without reducing initial slump by increasing dosage of a water reducing admixture.

D. Preparation: Do not order concrete earlier than is required to avoid delays. Cool forms, subgrades and reinforcing bars with water spray from fog nozzle prior to concrete placement.

E. Delivery: Site traffic shall be coordinated, and delivery times scheduled to minimize waiting times for concrete trucks.

F. Placement: Preparations shall be made to place and consolidate the concrete at the fastest possible rate. Maintain a continuous flow of concrete to the job site to avoid development of cold joints, during placement of slabs, apply fog spray to prevent moisture loss without causing surplus water to stand on concrete surface.

G. Finishing: Finish concrete as fast as practical. Continue fogging concrete during finishing. Where fogging is not possible, apply sprayable moisture-retaining film between finishing passes.

H. Curing: Formed concrete shall be covered with a waterproof material to retain moisture. Flat work shall be moisture cured as described in this specification. Moist curing shall continue for at least 7 days.

3.12 FIELD QUALITY ASSURANCE

A. Independent Testing Agency and Special Inspector shall each perform their prescribed inspection, sampling, and testing services as described in Part 1 of this specification section.

B. In cases where samples have not been taken or tests conducted as specified or strength of laboratory test cylinders for a particular portion of the structure fails to meet requirements of ACI 301, for evaluation of concrete strength, Structural Engineer shall have the right to order compressive or flexural test specimens or both be taken from the hardened concrete according to ASTM C42, load tests according to ACI 318, or such other tests as may be necessary to clearly establish the strength of the in situ concrete, and such tests shall be paid for by the Contractor. Where cores have been cut from the Work, Contractor shall fill voids with dry-pack and patch the finish to match the adjacent existing surfaces.

3.13 REPAIR OF DEFECTIVE AREAS

A. All repair of defective areas shall be made, with prior approval of Architect and Structural Engineer as to method and procedure, in accordance with Section 5 of ACI 301, except specified bonding compound must be used. Cosmetic repairs of minor defects in exposed concrete surfaces shall be in a manner acceptable to the Architect. Defective areas shall be deemed when:

1. Tests on core or prism specimens fail to show specified strengths.
2. Not formed as indicated or detailed.
3. Not plumb or level where so indicated or required to receive subsequent work.
4. Not true to intended grades and levels.
5. Cut, filled, or resurfaced, unless under direction of the Structural Engineer.
6. Debris is embedded therein.
7. Not fully in conformance with provisions of the drawings.
8. Damaged by hot or cold weather conditions.
9. Mixing time exceeds 90 minutes from ready-mix plant to the time of deposit.

B. Patch form tie holes at the following locations:

1. Unfinished exposed concrete (not scheduled for painting, plus at board formed concrete finish).
2. All other areas: Prime voids with bonding compound and fill with patching mortar. Strike flush without overlap, float to uniform texture to match adjacent surfaces.
3. Exposed areas scheduled for spray texture:

    a. Remove projections and protrusions: 1/16" or larger.
    b. Remove continuous ridges 1/32" or larger.
    c. Fill voids and pin holes.

4. Exposed areas scheduled for paint or epoxy:

    a. Remove projections, ridges, and other protrusions 1/32" or larger.
    b. Fill voids and pin holes 1/16" or larger.

5. Exposed areas not scheduled for paint or other finishes:

    a. Remove projections, ridges and other protrusions not conforming to requirements specified under Section 03 10 00.
    b. Fill voids and pin holes not conforming to requirements specified under Section 03 10 00.

C. All structural repairs shall be made, with prior approval of the Architect/Engineer, as to method and procedure, using the specified epoxy adhesive and/or epoxy mortar.

D. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

E. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

3.14 CEMENT GROUT AND DRY-PACK

A. Cement Grout: Thoroughly mix sufficient quantities to avoid combining different batches of grout mix. Ensure that grout completely fills all spaces and voids. Level, screed, or cut flush excess grout to produce smooth, neat, even exposed surfaces.

B. Dry-Pack: Thoroughly blend dry ingredients prior to mixing with water. Forcibly pack mixture to completely fill voids and spaces.

3.15 CLEANING

A. Clean exposed concrete to remove laitance, efflorescence and stains.

END OF SECTION 03 30 00

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SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fabrication and installation of masonry units. Work shall include, but not be limited to, the following items:

1. Concrete masonry units.
2. Split faced masonry units.
3. Decorative stone masonry.
4. All wall reinforcement, anchorage, insulation, lintels, and accessories.
5. Mortar for masonry including admixtures.
6. Grout for masonry.
7. Form control joints.
8. Built-in items supplied by other trades.

B. Products furnished but not installed under this section.

1. Dovetail anchors embedded in concrete work.
2. Adjustable masonry anchors connecting to structural steel.
3. Flashing reglets embedded in concrete work.

C. Products installed but not furnished under this section.

1. Placement of special anchorage for precast concrete installation.
2. Placement of steel anchors for ledge angle installation.
3. Placement of steel bearing pads for bar joist installation.
4. Placement of loose steel lintels.
5. Placement of fabricated steel items.
6. Placement of reglets for flashing.
7. Placement of window and door frame anchors.

D. Structural notes indicated on the drawings regarding unit masonry shall be considered part of this specification.

1.2 RELATED WORK

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 04 22 00 - Reinforced Unit Masonry.

C. Section 05 12 23 - Structural Steel.

D. Section 05 21 00 - Steel Joists.

E. Section 31 23 00 - Foundation Excavating and Backfilling.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards except where more stringent requirements are shown or specified. Where any provision of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

1. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3. ASTM A36 - Standard Specification for Carbon Structural Steel.
4. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
5. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
6. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
7. ASTM A951 - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
8. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
9. ASTM C5 - Standard Specification for Quicklime for Structural Purposes.
10. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale).
11. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
12. ASTM C91 - Standard Specification for Masonry Cement.
13. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
14. ASTM C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
15. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
16. ASTM C150 - Standard Specification for Portland Cement.
17. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
18. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
19. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
20. ASTM C331 - Standard Specification for Lightweight Aggregates for Concrete Masonry Units.
21. ASTM C387 - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar.
22. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
23. ASTM C476 - Standard Specification for Grout for Masonry.
24. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
25. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
26. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
27. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.
28. BIA - Brick Institute of America.
29. International Masonry Industry All-Weather Council (IMIAC) - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

30. NCMA - National Concrete Masonry Association.
31. TMS 402/602 - Building Code Requirements and Specifications for Masonry Structures.
32. UL - Underwriters Laboratories.

1.4 QUALITY ASSURANCE

A. Installation Company: Company shall have not less than five (5) years of documented experience in the construction of masonry projects of similar scope and complexity.

B. For the actual cutting and placing of concrete masonry units, use only skilled masons who are thoroughly experienced with the material and methods specified and thoroughly familiar with the design requirements. Workers shall have not less than three (3) years of documented experience in the construction of masonry walls.

C. Fire Resistance: Whenever a fire-resistant classification is indicated for unit masonry construction, provide concrete block units as tested and listed for the particular fire-resistant construction.

D. The governing building department reserves the right to take samples and make material tests prior to or during construction, without expense to the Contractor. Materials found to be defective shall be removed and replaced.

1.5 SUBMITTALS

A. Prepare and submit product data for the Architect/Engineer's approval. Data should include all horizontal reinforcement, anchoring devices, and all other embedded items herein specified.

B. Prepare and submit shop drawings detailing the fabrication, bending, and placement of reinforcing bars.

C. Submit manufacturer's recommendations and product data for the following items:

1. Admixtures.
2. Accessories.
3. Flashing materials.
4. Anchors and ties.
5. Horizontal joint reinforcing.
6. Waterproofing system and accessories.

D. Samples: Submit not less than five individual brick and masonry unit samples for verification of the following:

1. Full size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected during construction.
2. Colored masonry mortar samples for each color required showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar mix specified for this project.
3. Weep hole/vent material. Color to match mortar color.

4. Accessories embedded in the masonry.

E. Certificates:

1. Prior to delivery, submit to the Architect/Engineer a certificate or letter certifying products supplied for this project comply with the requirements of this specification.
2. Submit concrete unit masonry compressive strength test results demonstrating the units meet the specified strength. Test must be conducted by a qualified independent testing agency.

F. Submit mortar mix design and test results as follows:

1. Mix designs shall indicate type and proportions of ingredients in compliance with the proportion requirements of ASTM C270.
2. For mix designs not in accordance with the proportion requirements of ASTM C270, the mortar test history must be performed in accordance with ASTM C780 to verify performance with property requirements of ASTM C270. Tests must meet the type of mortar specified on the drawings. Tests must be done by a qualified independent testing agency.

G. Submit grout mix designs and test results as follows:

1. Mix designs shall indicate type and proportions of the ingredients in compliance with the proportion requirements of ASTM C476.
2. For mix designs not in accordance with the proportion requirements of ASTM C476, the grout test history must be performed in accordance with ASTM C1019 to verify performance with property requirements of ASTM C476. Tests must meet the type of grout specified on the drawings. Test must be done by a qualified independent testing agency.

1.6 MOCK-UP

A. Prior to installation, Contractor shall erect a four-foot long by four-foot high sample wall panel to verify selection made under sample submittals and to demonstrate aesthetic effects of materials and quality of workmanship expected throughout construction.

B. Erect panel in presence of Architect, Engineer, and Inspection Agency prior to installation of material.

C. Provide a separate panel for each type of face material and mortar.

D. Do not start work until the Architect/Engineer has given written acceptance of sample panels.

E. Accepted mock-up will demonstrate minimum standard for workmanship required for the entire project's masonry construction.

F. Construct mock-up panels for the following walls:

1. Interior masonry wall construction.

2. Exterior masonry wall construction.

G. Demolish and remove mock-ups from site when directed by the Architect/Engineer.

H. Mock-up may not remain as part of the project construction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver all materials in sufficient quantity and time to maintain approved construction schedule.

B. Deliver all packaged materials in manufacturer's original containers, with labels and markings intact and legible.

C. Immediately remove all damaged materials or container from site and replace with new items.

D. Store all items in a secure, dry location, out of the way of construction operations. Store materials on pallets a minimum 4" off the ground to prevent deterioration from moisture and contaminants.

E. All items shall be transported, stored, and erected in a manner that will avoid any further damage or deformation. Bent or deformed items will be rejected and shall be replaced or repaired at the expense of the responsible party.

F. Masonry accessories, including reinforcing steel, shall be stored clear of the ground to prevent deterioration or damage due to moisture, temperature changes, contaminants, and corrosion.

PART 2 - PRODUCTS

2.1 MASONRY

A. Hollow Load Bearing Concrete Masonry Units: ASTM C90 as follows:

1. Weight: Normal weight or lightweight.
2. Compressive Strength: As indicated on the drawings.
3. Nominal Size: As indicated on the drawings.
4. Actual Size: 3/8" less than nominal size.
5. Aggregates: Conform to ASTM C33 for normal weight or ASTM C331 for lightweight.
6. Exposed Face: Manufacturer's standard color and texture unless noted otherwise.
7. Provide special units, including bull noses, for 90°° corners, lintels, jambs, sash, control joints, headers, bond beams, and other conditions conforming to ASTM C90.

B. Hollow Non-Load Bearing Concrete Masonry Units (Interior Partition Walls): ASTM C129 as follows:

1. Weight: Normal weight or lightweight.

2. Compressive Strength: As indicated on the drawings.
3. Nominal Size: As indicated on the drawings.
4. Actual Size: 3/8" less than nominal size.
5. Aggregates: Conform to ASTM C33 for normal weight or ASTM C331 for lightweight.
6. Exposed Face: Manufacturer's standard color and texture unless noted otherwise. All exposed masonry to be free of chips, cracks, or other imperfections.
7. Provide special units, including bull noses, for 90°° corners, lintels, jambs, sash, control joints, headers, bond beams, and other conditions conforming to ASTM C129.

2.2 MORTAR AND GROUT

A. Mortar type for masonry construction shall be as designated in the General Notes of the drawings, conforming to ASTM C270, and grout shall conform to ASTM C476 and as follows:

1. Compressive Strength: As indicated on the drawings.
2. Portland Cement: ASTM C150, Type I non-staining, no air entrainment, natural color cement.
3. Blend Cement: ASTM C595.
4. Masonry Cement: ASTM C91.
5. Aggregate:

    a. Mortar: ASTM C144 Sand per California Building Code, standard masonry type, free of freezing and foreign matter.
    b. Grout: ASTM C404 Pea Gravel with not more than 5% passing the No. 8 sieve and 100% passing the 3/8-inch sieve per the California Building Code, standard masonry type, free of freezing and foreign matter.

6. Hydrated Lime: ASTM C207.
7. Quicklime: ASTM C5, non-hydraulic type.
8. Premix Mortar: ASTM C387, using gray cement, normal strength.
9. Water: Clean, free from injurious amounts of oil, alkali, organic matter, or other deleterious material.
10. Cold Weather Admixtures: ASTM C494, non-chloride, non-corrosive, accelerating type recommended by the manufacturer for use in masonry mortar of composition indicated.
11. Do not use calcium chloride in mortar or grout.

B. Pigmented Mortar: Select and portion pigments with other ingredients to produce the required color.

1. Limit mineral oxide pigments to only 10 percent of the Portland cement-lime mortar mix.
2. Manufacturers:

    a. Davis Colors.
    b. Lafarge Corporation.
    c. L.M. Scofield.

2.3 STEEL REINFORCEMENT

A. Reinforcing Steel: ASTM A615, Grade 60, deformed billet sizes as indicated on the drawings.

B. Deformed Reinforcing Wire: ASTM A496, with ASTM A153, Class B-2 zinc coating.

2.4 JOINT REINFORCEMENT

A. Joint reinforcement shall be formed from galvanized carbon steel wire in accordance with ASTM A641, Class 1 for interior walls, and ASTM A153, Class B-2 for exterior walls.

B. Welded wire units shall have minimum 9 gauge deformed continuous side rods and minimum 9 gauge plain cross rods. The overall unit width shall be 1-1/2" to 2" less than the wall thickness. Prefabricate into small lengths not less than 10 feet with matching corners and tees.

C. For single wythe masonry, provide ladder type reinforcement.

D. For multi-wythe construction, provide ladder type reinforcement, which has one side rod for each face shell of hollow masonry units more than 4 inches in width, plus one side rod for each wythe of masonry 4 inches in width.

E. Adjustable Tab Design: Single pair of side rods and rectangular box-type cross ties spaced not more than 16 inches on center, with side rods spaced for embedment within each face shell of the back-up wythe and with separate adjustable ties engaging the cross ties and extending to engage the outer wythe by at least 1-1/2 inches and spaced not more than 16 inches on center. Use where horizontal joints of facing wythe do not align with the back-up wythe or where the facing wythe is of different material than back-up wythe.

2.5 WIRE TIES AND ANCHORS

A. Provide wire ties and anchors as required for the wall construction indicated on the drawings which comply with the following:

1. Exterior Walls: Galvanized carbon steel wire conforming to ASTM A153, Class B-2 coating.
2. Interior Walls: Galvanized carbon steel wire conforming to ASTM A641, Class 1 coating.

2.6 STEEL PLATE

A. Exterior Walls: ASTM A36 steel, hot-dip galvanized to comply with ASTM A123; temper as required to support loads imposed without exceeding allowable design stresses.

B. Interior Walls: ASTM A36 steel, shop painted with one coat rust-inhibitive primer and two coats of finish paint.

2.7 ADJUSTABLE ANCHORS FOR CONNECTING TO STRUCTURAL FRAME

A. Provide two-piece assemblies that allow vertical or horizontal movement between the masonry wall and the structural frame but resist the tension and compression forces applied perpendicular to it.

B. Provide manufacturer's standard anchors with crimped 1/4-inch diameter wire anchor section for welding to steel and the triangular shaped 1/4-inch diameter wire tie section sized to extend within 1 inch of the masonry face.

2.8 WALL FLASHING COMPONENTS

A. Flexible Flashing: Self-sealing, self-healing, fully adhered, composite cold applied 40 mil flashing.

1. Primer: Product recommended by flashing manufacturer.
2. Adhesive for Flashing: Product recommended by flashing manufacturer.
3. Products:

a. Perm-A-Barrier by W.R. Grace & Company.
b. Flashgard by Firestone.
c. Polyguard 300 by Polyguard Products, Inc.

2.9 MASONRY WALL INSULATION

A. Loose - Granular Perlite Insulation: ASTM C549, Type II or IV.

B. Extruded Polystyrene Board Insulation: ASTM C578, Type IV. Rigid, cellular, polystyrene thermal insulation with closed cells and integral high-density skin, formed by the expansion of polystyrene base resin in an extrusion process.

2.10 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2 cup dry measure tetrasodium polyphosphate (Spic and Span), and 1/2 cup dry measure laundry detergent dissolved in one gallon of water.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Bond Breaker Strips: Asphalt saturated organic roofing felt complying with ASTM D226, Type 1, 15 lbs. felt.

B. Pre-molded Control Joint Strips: Styrene-Butadiene rubber compound conforming to ASTM D2000, Designation M2AA-805. Designed to fit a standard sash block and to maintain lateral stability in masonry walls. Paintable pick proof caulk finish on the interior wall faces is prudent across the board for interior joints within the jail area that are at 1/2" and less. If CJs larger than are required elsewhere within the detention areas, a heavy-gauge stainless steel or painted metal plate closure fastened with tamper proof screws to cover the joints is more appropriate.

C. Compressible Filler: Pre-molded filler strips complying with ASTM D1056, Type 2, Class A, Grade 1; compressible up to 35 percent. Provide widths and thicknesses as indicated on the drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field conditions are acceptable and are ready to receive work.

1. Verify foundations are constructed with tolerances conforming to the requirements of ACI 117.
2. Verify reinforcing dowels are positioned in accordance with the drawings.

B. Verify items provided by other Sections of work are properly sized and located.

C. Verify built-in items are properly located and ready for roughing into masonry work.

D. Beginning of installation means Installer accepts existing conditions.

3.2 PREPARATION

A. Lay out walls in advance for accurate spacing of bond patterns, with uniform joint widths and properly located openings, expansion joints, and offsets.

B. Direct and coordinate placement of metal anchors supplied to other trades for their installation when required.

C. Install metal anchors other than those required to be installed by other trades.

D. The Contractor is responsible to design, provide, and install bracing that will ensure stability of masonry during construction. Maintain until building structure provides permanent bracing.

E. Ensure items built-in by other trades for this work are properly located and sized.

3.3 COURSING

A. Establish lines, levels, and coursing. Protect survey lines from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Lay concrete masonry units in running bond pattern. Course one unit and one mortar joint to equal 8 inches. Form mortar joints.

3.4 MORTAR MIX

A. Thoroughly mix mortar ingredients in quantities needed for immediate use.

B. Use mortar within two hours of mixing at temperatures over 80°°F and 2-1/2 hours at temperatures under 50°°F.

C. If necessary, re-temper mortar within two hours of mixing to replace water lost by evaporation. Do not re-temper after two hours of mixing.

3.5 GROUT

A. Thoroughly mix grout ingredients in quantities needed for immediate use. Place grout within 1-1/2 hours from introducing water to the mixture and prior to the initial set. Retempered grout is not allowed.

B. Do not use anti-freeze compounds to lower the freezing point of grout.

C. Do not use admixtures in grout.

3.6 COLD-WEATHER CONSTRUCTION

A. When ambient temperature is below 40°F, implement cold weather procedures.

B. Special cold weather requirements for various temperature ranges are as follows:

1. Air temperature 40°F to 32°F: Sand or mixing water shall be heated to produce mortar temperatures between 40°F to 120°F.
2. Air temperature 32°F to 25°F:

    a. Sand and mixing water shall be heated to produce mortar temperatures between 40°F to 120°F. Maintain temperature of mortar on boards above freezing.
    b. Grout aggregates and mixing water shall be heated to produce grout temperature between 70°F to 120°F.

3. Air temperature 25°F to 20°F: Comply with requirements for air temperature between 32°F to 25°F and the following:

    a. Provide heat sources on both sides of the wall under construction to heat masonry surfaces to 40°F. Windbreaks shall be used when wind is in excess of 15 miles per hour.
    b. Heat masonry to a minimum temperature of 40°F prior to grouting.

4. Air temperature 20°F and below. Comply with requirements for air temperature between 32° to 20°F and the following:

    a. Enclosure and auxiliary heat shall be provided to maintain air temperature above freezing. Do not lay masonry units having a temperature below 20°F.

C. Cold-Weather Protection:

1. When the mean daily air temperature is 40°F to 25°F, masonry shall be completely covered for 24 hours with weather-resistive membrane.

2. When the mean daily air temperature is 25°F to 20°F, masonry shall be completely covered for 24 hours with insulating blankets with a weather-resistive covering. Extend time period to 48 hours for grouted masonry.
3. When the mean daily air temperature is 20°F or below, masonry temperature shall be maintained above freezing for 24 hours by enclosure and auxiliary heating. Extend time period to 48 hours for grouted masonry.

D. Do not lay masonry units having either a temperature below 20°F or containing frozen moisture, visible ice, or snow on their surfaces.

E. Remove visible ice and snow from the top surface of existing foundations and masonry to receive new construction. Heat these surfaces above freezing.

F. Top of all walls not enclosed or sheltered shall be covered with strong weather-resistive material at the end of each day or shutdown.

G. Partially completed walls shall be covered at all times when work is not in progress.

H. Any section of masonry deemed frozen and damaged shall be removed before continuing construction of that section.

I. Masonry units shall be dry at the time of placement. Wet or frozen units shall not be laid.

J. All cold weather masonry construction shall conform to TMS 402/602 Building Code Requirements and Specifications for Masonry Structures.

3.7 HOT WEATHER CONSTRUCTION

A. Hot weather construction is defined when:

1. The ambient air temperature exceeds 100°F or exceeds 90°F with a wind velocity greater than 8 mph.

B. Hot Weather Procedures:

1. Maintain sand piles in a damp, loose condition.
2. Provide necessary conditions and equipment to produce mortar having a temperature below 120°F.
3. Flush mixer, mortar transport container, and mortar boards with cool water before they come in contact with mortar ingredients or mortar.
4. Use mortar within two hours of initial mixing.
5. Fog spray all newly constructed masonry until damp, at least three times a day until the masonry is three days old.
6. Do not spread mortar beds more than 4 feet ahead of masonry. Set masonry within one minute of spreading mortar.

3.8 PLACING AND BONDING

A. Unless otherwise noted, construct masonry in running bond pattern.

B. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

C. Lay hollow masonry units with face shell bedding on head and bed joints.

D. Bed and Head Joints:

1. Unless otherwise required, construct 3/8" thick bed and head joints.
2. At foundation, construct bed joint of the starting course a thickness not less than 1/4" and not more than 3/4".
3. Unless otherwise noted, tool joint with a round jointer when the mortar is thumbprint hard.
4. Remove masonry protrusions extending 1/2" or more into cells or cavities to be grouted.
5. Where masonry rests on concrete, the concrete shall be sandblasted or bushed.

E. Collar Joints:

1. Unless otherwise required, solidly fill collar joints less than 3/4 inch wide with mortar as the job progresses.

F. Place hollow units as follows:

1. With face shells of bed joints fully mortared.
2. With webs fully mortared in:

    a. All courses of piers, columns, and pilasters.
    b. In the starting course on foundations.
    c. When necessary to confine grout or loose fill.
    d. When otherwise required.

3. With head joints mortared, a minimum distance from each face equal to the face shell thickness of the unit.
4. Vertical cells to be grouted are aligned and openings are unobstructed.

G. Place solid units as follows:

1. Unless otherwise required, solidly fill bed and head joints with mortar.
2. Do not fill head joints by grouting with mortar.
3. Construct head by shoving mortar tight against the adjoining unit.
4. Do not deeply furrow bed joints.

H. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

I. Fully bond external and internal corners and intersections.

J. Remove excess mortar as work progresses.

K. Interlock intersections and external corners.

L. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

M. Where built-in items are too embedded into hollow masonry units, place a layer of metal lath in the joint below and fill cavities with mortar or grout.

N. Isolate masonry partitions from vertical structural framing members with a control joint and anchor as detailed on the drawings.

O. Where non-load bearing masonry partitions extend to underside of structural system, terminate masonry 1/2 inch to 3/4 inch below structure to allow for live load deflection to occur. Fill gaps with compressible joint filler or compressible fire stop material as required.

P. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry units at corners.

3.9 JOINTS

A. Maintain joint width to match abutting existing masonry wall joints.

B. Neatly tool exposed exterior and interior mortar joints.

C. Rake out mortar joints flush where sealants are shown.

D. Cut mortar joints flush where ceramic or quarry wall tile is scheduled, resilient and tile base is scheduled, and cavity insulation vapor barrier adhesive is applied.

3.10 WEEPS AND VENTS

A. Install cavity vents at the top of each cavity space and below shelf-angles at 32 inches on center horizontally.

3.11 CAVITY WALL

A. Do not permit mortar to drop or accumulate into the cavity air space or plug weep holes.

B. Construct inner wythe ahead of outer wythe to receive cavity insulation and vapor barrier adhesive. Strike joints facing the cavity flush.

C. Tie exterior wythe to backup with continuous horizontal joint reinforcing embedded in mortar joints at a maximum distance of 16 inches on center vertically.

D. Place horizontal reinforcing with drip centered over cavity.

E. Install cavity wall insulation and weeps as specified herein.

3.12 HORIZONTAL REINFORCEMENT AND ANCHORS

A. Install horizontal joint reinforcement as follows:

1. Interior non-load bearing walls - 24 inches on center vertically.
2. Exterior walls and interior load bearing walls - 16 inches on center vertically.
3. Parapet walls - 8 inches on center vertically unless noted otherwise.

4. Foundation walls - 8 inches on center vertically unless noted otherwise.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place joint reinforcement continuous in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches. Extend minimum 16 inches each side of openings.

E. Place joint reinforcement so longitudinal wires are embedded in mortar with a minimum cover of 1/2 inch when not exposed to weather or earth, and 5/8 inch when exposed to weather or earth.

F. Anchor masonry to structural members where masonry abuts or faces such members.

G. Wall Ties:

1. Embed the ends of wall ties in mortar joints. Embed wall tie ends at least 1/2" into the outer face shell of hollow units. Embed wire wall ties at least 1-1/2" into the mortar bed of solid masonry units or solid grouted hollow units.
2. Do not bend wall ties after embedded in grout or mortar.
3. Unless otherwise required, install adjustable ties in accordance with the following requirements.

    a. One tie for each 1.77 square feet of wall area.
    b. Do not exceed 16 inches horizontal or vertical spacing.
    c. The maximum misalignment of bed joints from one wythe to the other is 1-1/4".
    d. The maximum clearance between connecting parts of the ties is 1/16".
    e. When pintle legs are used, provide ties with at least two legs made of wire size W2.8.
    f. Install wire ties perpendicular to a vertical line on the face of the wythe from which they protrude. Where one-piece ties or joint reinforcement are used, the bed joints of adjacent wythes shall align.
    g. Unless otherwise required, provide additional unit ties around all openings larger than 16 inches in either dimension. Space ties around perimeter of opening at a maximum of 3 feet on center. Place ties within 12 inches of opening.

H. Veneer Anchors:

1. Embed veneer anchors in mortar joint and extend into the veneer a minimum of 1-1/2 inch at least 5/8 inch cover to the outside face.
2. Install adjustable veneer anchors as follows:

    a. The maximum misalignment of bed joints from one wythe to the other is 1-1/4".
    b. The maximum clearance between connecting parts of the ties is 1/16".
    c. When pintle legs are used, provide anchors with at least two legs made of wire size W2.8.

d. Provide at least one adjustable two-piece anchor of wire size W1.7 corrugated sheet metal anchor for each 2.67 square feet of wall area.

3. Install non-adjustable veneer anchors for each 3.5 square feet of wall area.
4. Space anchors at a maximum of 16 inches horizontally and 16 inches vertically.

I. Provide additional anchors around all openings larger than 16 inches in either dimension. Space anchors around the perimeter of an opening at a maximum of 3 feet on center. Place anchors within 12 inches of the opening.

3.13 VERTICAL REINFORCEMENT

A. Support and secure reinforcing bars from displacement beyond the tolerances allowed by construction loads or by placement of grout or mortar. Maintain position within 1/2 inch of masonry unit or formed surface, but not less than 1/4 inch (only when fine grout is used).

B. Dowels in footings shall be set to align with cores containing reinforcing steel.

C. Place and consolidate grout fill without displacing reinforcing. Completely embed reinforcing bars in grout.

D. All cells containing reinforcing in concrete blocks shall be filled solid with grout.

E. Do not bend reinforcement after it is embedded in grout or mortar.

F. Reinforce masonry unit cores and cavities with vertical reinforcement bars and grout as indicated on the drawings. Place reinforcement and ties in grout spaces prior to grouting.

G. Retain vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 192 bar diameters.

H. Place steel in walls and flexural elements within 1/2 inch of required location.

I. Place vertical bars within 2 inches of the required location along the length of the wall.

3.14 REINFORCED MASONRY

A. Lay masonry units with core cells vertically aligned and clear of mortar dropping, debris, loose aggregates, and any material deleterious to masonry grout.

B. Support and secure reinforcing bars from displacement before grouting. Maintain position within 1/2 inch of dimensioned position.

C. Do not place grout until height of masonry to be grouted has attained sufficient strength to resist grout pressure.

D. Grout spaces less than two inches in width with fine grout using low lift grouting techniques. Grout spaces two inches or greater in width with coarse grout using high lift or low lift grouting techniques.

E. When grouting has stopped for more than one hour, terminate grout 1-1/2 inch below the top of the upper masonry unit to form a positive key for subsequent grout placement.

F. Do not wet concrete masonry units before laying.

3.15 GROUTING

A. Place grout in lifts not to exceed five feet. Consolidate grout at time of placement.

1. Consolidate grout pours 12 inches or less in height by mechanical vibration or by puddling.
2. Consolidate grout pours exceeding 12 inches in height by mechanical vibration and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.

B. When the grout pour height exceeds 5 feet 4 inches, provide a cleanout opening no less than 3 inches high at the bottom of each cell to be grouted by cutting one face shell of the masonry unit. Opening should be of sufficient size to permit removal of debris.

C. Pump grout into spaces. Maintain water content in grout to intended slump without aggregate segregation.

D. Limit grout lift to 60 inches and rod for grout consolidation. Wait 30 to 60 minutes before placing next lift.

3.16 GROUTING REINFORCED CONCRETE BLOCK WALLS

A. Provide reinforcing bars at indicated spacing and fill cavities and voids solid with grout having a 28-day compressive strength as listed in the General Notes of the drawings.

3.17 GROUTING BLOCK CELLS BELOW LINTELS AND BEAMS

A. For lintel spans greater than 5'-0", grout block cells 24 inches beneath the lintel and 24 inches on each side of the opening.

3.18 LINTELS AND BOND BEAMS

A. Steel Lintels: Install steel lintels supplied from Division 5 of this specification. Provide a minimum of 8inches of end bearing on each side of the opening unless noted otherwise. All exterior exposed steel lintels shall be hot-dip galvanized in accordance with ASTM A123.

B. Bond Beam Lintels:

1. Use specially shaped lintel units at hollow masonry unit walls, with reinforcing bars as shown and filled with concrete grout.
2. Provide minimum 8 inches of end bearing at each side of opening.
3. Provide reinforced concrete block lintels over openings less than 3'-0" wide that are not scheduled.

4. Place and consolidate the grout without disturbing the reinforcing.
5. Allow lintels to reach 100 percent of their design strength before removing temporary supports.
6. Do not place vertical control joints through bond beams. Place the vertical control joints at each end the bond beam lintel.

3.19 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control and expansion joints except above wall openings.

B. Provide vertical expansion, control, and isolation joints as indicated on the drawings. If joints are not indicated, provide control joints at a maximum spacing of 30'-0".

C. Install all built-in masonry accessory items as work progresses.

D. Exposed joints to be tooled slightly concave and concealed joints to be struck flush. Use a 3/4-inch diameter round tool for making 1/2-inch joints.

1. Bed Joints: Not less than 3/8-inch and not more than 2-inch thick.
2. Head Joints: To match bed joints.

E. Rake out mortar where sealants are shown or required.

3.20 BASE FLASHING

A. Place flashing in accordance with the manufacturer's recommendations.

B. Install reglets and nailers for flashing and other related work where shown on the drawings.

C. Extend flashing through veneer, turn up 8 inches, and bed into a mortar joint of the masonry. Seal to concrete and/or steel framing.

D. Lap end joints minimum 6 inches and seal watertight.

E. Use adhesives and sealant as recommended by the flashing manufacturer.

3.21 BUILT-IN WORK AND EMBEDDED ITEMS

A. As work progresses, build in metal doorframes, window frames, wood nailers, steel angle lintels, anchor bolts, bearing plates, and other items supplied by other trades.

B. Place pipes and conduits passing horizontally through masonry beams or masonry walls in steel sleeves or cored holes.

C. Install pipes and conduits passing horizontally through non-bearing masonry partitions.

D. Install and secure connectors, flashing, weep holes, weep vents, nailing blocks, and other accessories.

E. Do not embed aluminum conduits, pipes, and accessories in masonry, grout, or mortar, unless effectively coated or covered to prevent aluminum-cement chemical reaction or electrolytic action between aluminum and steel.

F. Build-in items plumb and true.

G. Bed anchors of hollow metal frames in mortar joints. Fill frame voids solid with mortar. Fill masonry cores with grout minimum 12 inches from framed opening.

H. Do not build-in organic materials that will be subjected to rot or deterioration.

3.22 TOLERANCES

A. Comply with tolerances in the MSJC Code and the following:

1. Maximum variation from masonry unit to adjacent masonry unit is 1/32 inch.
2. Maximum variation from vertical and horizontal building lines shall be 1/4 inch in 10 feet and 3/8 inch in 20 feet or more.
3. Maximum variation from alignment of columns and pilasters shall be 1/4 inch.
4. Maximum variation from plumb shall be 1/4 inch per story, non-cumulative.
5. Maximum variation from level coursing shall be 1/8 inch in 3 feet, 1/4 inch in 10 feet, and 1/2 inch in 30 feet.
6. Maximum variation of joint thickness shall be 1/8 inch in 3 feet.
7. Maintain flush face on exposed masonry surfaces.
8. Masonry to receive thin set ceramic tile shall have flush mortar joints and a maximum surface variation or 1/8 inch.

3.23 CUTTING AND FITTING

A. Cut and fit masonry for chases, pipes, conduit, sleeves, and grounds. Coordinate fully with other trades to ensure correct size, shape, and location.

B. Obtain the Architect/Engineer's review prior to cutting or fitting any area not indicated on drawings or which may impair appearance or strength of masonry work.

3.24 CLEANING

A. Clean work under provisions of Division 1.

B. Remove excess mortar and smears.

C. Replace defective mortar. Match existing work.

D. Clean soiled surfaces with cleaning solution.

E. Use non-metallic tools in cleaning operation.

F. Clean exposed masonry surfaces of all stains efflorescence, mortar, or grout droppings or debris.

G. Where new masonry wall surfaces remain stained or defaced by mortar or any other foreign matter to a degree not acceptable to the Owner, clean surfaces by a light sandblasting at no added cost. Avoid damaging masonry surfaces and joints during sandblasting operations.

3.25 PROTECTION OF EXISTING WORK

A. Protect finished installation under the provisions of Division 1.

B. Without damaging completed work, provide protective boards at exposed external corners that may be damaged by construction activities.

C. Water Repellent Coating:

1. Apply sufficient coats of the approved material to achieve a consistent and uniform appearance, free from runs and sags, and with a uniformly resistive surface that will prevent penetration of water through the walls for the required period of warranty.
2. Twenty days after completion of the portion of work, and as a condition of its acceptance, demonstrate by running a water test showing it will successfully repel water.

    a. Notify the Architect/Engineer at least 72 hours in advance and conduct the test in the Architect/Engineer's presence.
    b. By means of an outrigger or similar acceptable equipment, place the nozzle of a 3/4" garden hose at a point approximately 10 feet away from the top of the wall, aiming the nozzle at a slight downward angle to direct the full stream of water onto the wall.
    c. Run the water onto the wall at full available force for not less than 4 hours.
    d. Upon completion of the 4-hour period, inspect the interior surfaces of the wall for evidence of moisture penetration.

3. If evidence of moisture penetration is discovered, apply an additional coat of the water repellent material to the exterior surface in areas directed by the Architect/Engineer, repeating the application and the testing, at no additional cost to the Owner, until no evidence of moisture penetration is found.

END OF SECTION 04 20 00

SECTION 042613 - MASONRY VENEER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Decorative concrete masonry units.
2. Mortar.
3. Ties and anchors.
4. Embedded flashing.
5. Miscellaneous masonry accessories.

B. Products Installed but not Furnished under This Section:

1. Cast-stone trim in masonry veneer.
2. Steel lintels in masonry veneer.
3. Steel shelf angles for supporting masonry veneer.

C. Related Requirements:

1. Section 042200 "Concrete Unit Masonry" for load bearing Concrete Masonry Unit wall construction.
2. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
3. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:

1. Decorative CMUs, in the form of small-scale units.
2. Colored mortar.
3. Weep holes and vents.

D. Samples for Verification: For each type and color of the following:

1. Decorative CMUs.
2. Pigmented mortar. Make Samples using the same sand and mortar ingredients to be used on Project.
3. Weeps and vents.
4. Accessories embedded in masonry.

1.6 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include data on material properties, and material test reports substantiating compliance with requirements.

2. Integral water repellant used in decorative CMUs.
3. Cementitious materials. Include name of manufacturer, brand name, and type.
4. Mortar admixtures.
5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
6. Anchors, ties, and metal accessories.

C. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.

D. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.

1. Build sample panels for each typical exterior wall area in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness.
2. Build sample panels facing south.
3. Where masonry is to match existing, build panels adjacent and parallel to existing surface.
4. Clean one-half of exposed faces of panels with masonry cleaner indicated.
5. Protect approved sample panels from damage and store them at the project site for the duration of the project.
6. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

    a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for each type of exposed unit masonry construction, and typical exterior wall in sizes approximately 96 inches (2400 mm) long by 96 inches (2400 mm) high by full thickness, including face and backup wythes and accessories.

    a. Include a sealant-filled joint at least 16 inches (400 mm) long in each mockup.
    b. Include lower corner of window opening at upper corner of exterior wall mockup. Make the opening approximately 16 inches (400 mm) wide by 24-inch (600-mm) high.
    c. Include through-wall flashing installed for a 24-inch (600-mm) length in corner of exterior wall mockup approximately 16 inches (400 mm) down

from top of mockup, with a 12-inch (300-mm) length of flashing left exposed to view (omit masonry above half of flashing).

d. Include masonry backing wall, water and air-resistive barrier, veneer anchors, flashing, cavity drainage material, and weeps in exterior masonry-veneer wall mockup.

3. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
4. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
5. Protect accepted mockups from the elements with weather-resistant membrane.
6. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

    a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

7. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of veneer, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches (600 mm) down face of veneer, and hold cover securely in place.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry. Immediately remove grout, mortar, and soil that come in contact with masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects will be exposed in the completed Work.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

2.3 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. Integral Water Repellent: Provide units made with integral water repellent for exposed units.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E514/E514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

C. Decorative CMUs: ASTM C90.

1. Density Classification: Normal weight.
2. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less than nominal dimensions.
3. Pattern and Texture:

a. Standard pattern, split-face finish. Match existing adjacent finish.

4. Colors: Match existing adjacent building colors unless otherwise noted.

2.4 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C91/C91M.

E. Mortar Cement: ASTM C1329/C1329M.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

G. Colored Cement Products: Packaged blend made from portland cement and hydrated lime, masonry cement, or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
2. Pigments shall not exceed 10 percent of portland cement by weight.
3. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.

H. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4-inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

I. Cold-Weather Admixture: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from the same manufacturer.

K. Water: Potable.

2.5 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Mill-Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A641/A641M, Class 1 coating.
2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
3. Stainless Steel Wire: ASTM A580/A580M, Type 304.
4. Galvanized-Steel Sheet: ASTM A653/A653M, Commercial Steel, G60 (Z180) zinc coating.
5. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.

6. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.

C. Corrugated-Metal Ties: Metal strips not less than 7/8 inch (22 mm) wide with corrugations having a wavelength of 0.3 to 0.5 inch (7.6 to 12.7 mm) and an amplitude of 0.06 to 0.10 inch (1.5 to 2.5 mm) made from 0.060-inch- (1.52-mm-) thick, steel sheet, galvanized after fabrication, or 0.062-inch- (1.59-mm-) thick, stainless-steel sheet.

D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized steel or stainless-steel wire.
2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel, or stainless-steel wire.

E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch- (2.66-mm-) thick, steel sheet, galvanized after fabrication or 0.109-inch- (2.78-mm-) thick, stainless-steel sheet.
2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel, or stainless-steel wire.
3. Corrugated-Metal Ties: Metal strips not less than 7/8 inch (22 mm) wide with corrugations having a wavelength of 0.3 to 0.5 inch (7.6 to 12.7 mm) and an amplitude of 0.06 to 0.10 inch (1.5 to 2.5 mm) made from 0.075-inch- (1.90-mm-)-thick steel sheet, galvanized after fabrication, or 0.078-inch- (1.98-mm-) thick, stainless steel sheet with dovetail tabs for inserting into dovetail slots in concrete.

F. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf (445-N) load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch (1.5 mm).
2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.105-inch- (2.66-mm-) thick steel sheet, galvanized after fabrication, and 0.109-inch-(2.78-mm-) thick, stainless-steel sheet.
3. Fabricate wire ties from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel or stainless-steel wire unless otherwise indicated.
4. Fabricate wire connector sections from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized, carbon, or stainless-steel wire.
5. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.
6. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with a projecting vertical tab having a slotted hole for inserting wire tie.

7. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having holes for inserting vertical legs of wire tie formed to fit anchor section.
8. Seismic Masonry-Veneer Anchors: Connector section and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having slotted holes for inserting vertical leg of connector section. Connector section consists of a rib-stiffened, sheet metal bent plate with down-turned leg designed to fit in anchor section slot and with integral tabs designed to engage continuous wire.
9. Seismic Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having holes for inserting vertical legs of wire tie. Wire tie has sheet metal clip welded to it with integral tabs designed to engage continuous wire.

2.6 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch (0.40 mm) thick.
2. Copper: ASTM B370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. (4.9-kg/sq. m) weight or 0.0216-inch (0.55 mm) thick or ASTM B370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. (3.7-kg/sq. m) weight or 0.0162 inch (0.41 mm) thick.
3. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.7 m). Provide splice plates at joints of formed, smooth metal flashing.
4. Fabricate through-wall metal flashing embedded in masonry from stainless steel, or copper, with ribs at 3-inch (76-mm) intervals along length of flashing to provide an integral mortar bond.
5. Fabricate through-wall flashing with snap lock receiver on exterior face where indicated to receive counterflashing.
6. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
7. Fabricate through-wall flashing with sealant stop where indicated. Fabricate by bending metal back on itself 3/4 inch (19 mm) at exterior face of wall and down into joint 1/4 inch (6 mm) to form a stop for retaining sealant backer rod.
8. Fabricate metal drip edges, and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches (76 mm) into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam sheds water.
9. Fabricate metal drip edges from stainless steel. Extend at least 3 inches (76 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
10. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches (76 mm) into wall and out to exterior face of wall. At exterior face of wall, bend metal

back on itself for 3/4 inch (19 mm) and down into joint 1/4 inch (6 mm) to form a stop for retaining sealant backer rod.
11. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.
12. Solder metal items at corners.

B. Flexible Flashing: Use one of the following unless otherwise indicated:

1. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.040 inch (1.02 mm).
   a. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

2. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D4637/D4637M, 0.040 inch (1.02 mm) thick.

C. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
4. Where flashing is fully concealed, use flexible flashing.

D. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.
2. Solder for Copper: ASTM B32, Grade Sn50 with maximum lead content of 0.2 percent.
3. Elastomeric Sealant: ASTM C920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.

E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

F. Termination Bars for Flexible Flashing: Aluminum, or Stainless-steel steel bars 1/8 inch by 1 inch (3 mm by 25 mm).

G. Termination Bars for Flexible Flashing: Stainless steel sheet 0.019 inch by 1-1/2 inches (0.48 mm by 38 mm) with a 3/8-inch (9.5 mm) sealant flange at top.

H. Termination Bars for Flexible Flashing: Aluminum sheet 0.064 inch by 1-1/2 inches (01.6 mm by 38 mm) with a 3/8-inch (9.5 mm) sealant flange at top.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or PVC.

B. Weep/Vent Products: Use the following unless otherwise indicated:
   1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.

C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

      a. Strips, full depth of cavity and 10 inches (250 mm) high, with dovetail-shaped notches 7 inches (175 mm) deep that prevent clogging with mortar droppings.

2.8 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.9 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

   1. Do not use calcium chloride in mortar or grout.
   2. Use portland cement-lime, masonry cement, or mortar cement mortar unless otherwise indicated.
   3. For exterior masonry, use portland cement-lime, masonry cement, or mortar cement mortar.
   4. For reinforced masonry, use portland cement-lime, masonry cement, or mortar cement mortar.
   5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion, or Property Specification. Use Type N unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type S.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Pigments shall not exceed 5 percent of masonry cement, or mortar cement by weight.
3. Mix to match Architect's sample.
4. Application: Use pigmented mortar for exposed mortar joints.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.
2. Application: Use colored aggregate mortar for exposed mortar joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare a written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

D. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

E. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4-inch (6 mm) in a story height or 1/2-inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12 mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12 mm) maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12 mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12 mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12 mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12 mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).

4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond. Do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

B. Lay CMUs with face shells fully bedded in mortar and with head joints of depth equal to bed joints. At the starting course, fully bed entire units, including area under cells.

1. At anchors and ties, fully bed units and fill cells with mortar as needed to fully embed anchors and ties in mortar.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

1. For glazed masonry units, use a nonmetallic jointer 3/4 inch (19 mm) or more in width.

3.6 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to concrete and masonry backup with seismic masonry-veneer anchors to comply with the following requirements:

1. Fasten seismic anchors to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed tie sections, connector sections, and continuous wire in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 18 inches (458 mm) o.c. vertically and 24 inches (610 mm) o.c. horizontally, with not less than one anchor for each 2 sq. ft. (0.2 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 8 inches (203 mm), around perimeter.

B. Provide not less than 1-1/2 inch (38 mm) of airspace between back of masonry veneer and face of insulation.

1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space not less than 1 inch (25 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.8 EXPANSION JOINTS

A. General: Install expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span expansion joints without provision to allow for in-plane wall or partition movement.

B. Form expansion joints as follows:

1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches (100 mm) in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in compressible joint fillers where indicated.

4. Form open joint full depth of brick wythe and of width indicated, but not less than 1/2 inch (13 mm) for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."

C. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch (10 mm).

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.9 LINTELS

A. Install steel lintels where indicated.

B. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within a mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. Extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches (200 mm); with upper edge tucked under air and water-resistive barrier, lapping at least 4 inches (100 mm).
3. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
5. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
6. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal drip edge.

7. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
8. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/vent products to form weep holes.
2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
3. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.
4. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
5. Trim wicking material flush with outside face of wall after mortar has set.

E. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

F. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

C. Testing Prior to Construction: One set of tests.

D. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67 for compressive strength.

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.

F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.

G. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for mortar air content and compressive strength.

3.12 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.13 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches (100 mm) in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."

3. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042613

SECTION 05 12 23 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fabrication and erection of structural steel work, as shown on the drawings and specified herein. Work shall include, but not be limited to the following items:

1. Structural steel.
2. Base and bearing plates.
3. Deck support angles and framing for roof openings.
4. Steel lintel members for masonry openings.
5. Edge angles and bent plates.
6. Connection plates.
7. Architecturally Exposed Structural Steel (AESS).
8. All other steel items as listed in AISC - "Code of Standard Practice for Steel Buildings and Bridges" as shown on structural and architectural drawings.

B. Work shall also include grouting of all structural steel members where indicated.

C. Structural notes indicated on the drawings regarding structural steel framing should be considered a part of this specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 05 05 23 - Welding.

D. Section 05 21 00 - Steel Joists.

E. Section 05 31 00 - Steel Deck.

F. Section 05 40 00 - Cold-Formed Steel Framing Systems.

G. Section 05 50 00 - Metal Fabrications.

H. Section 05 51 00 - Metal Stairs.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards except where more stringent requirements are shown or specified. Where any provisions of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

1. AISC - Specification for Structural Joints Using High-Strength Bolts.

2. AISC 303 - Code of Standard Practice for Buildings and Bridges.
3. AISC 341-10 - Seismic Provisions for Structural Steel Buildings, including any Supplements.
4. AISC 358-10- Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications.
5. AISC 360-10- Specification for Structural Steel Buildings.
6. ASTM A6 - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
7. ASTM A36 - Standard Specification for Carbon Structural Steel.
8. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
9. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
10. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
11. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
12. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
13. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
14. ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.
15. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
16. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
17. ASTM A992 - Standard Specification for Steel for Structural Steel Shapes.
18. ASTM A1085 - Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS).
19. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
20. ASTM E94 - Standard Guide to Radiographic Examination Using Industrial Radiographic Film.
21. ASTM E165 - Standard Practice for Liquid Penetrant Examination for General Industry.
22. ASTM E709 - Standard Guide for Magnetic Particle Testing.
23. ASTM F436 - Standard Specification for Hardened Steel Washers.
24. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
25. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
26. ASTM F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength, Inch Dimensions.
27. AWS D1.1 - Structural Welding Code - Steel.
28. AWS D1.8 - Structural Welding Code - Seismic Supplement.
29. SSPC - Steel Structures Painting Council.

1.4 QUALITY ASSURANCE

A. Fabrication, Erection, and Welding Qualifications:

1. Fabricate structural steel members in accordance with AISC Specification for the design, fabrication, and erection of structural steel for buildings.
2. Steel fabricator shall not have less than five (5) years of continuous experience in fabrication of structural steel framing.
3. Steel detailer shall have five (5) years of continuous experience in the production of steel fabrication drawings.
4. Steel erector shall not have less than five (5) years of continuous experience in the erection of structural steel framing.
5. All welding of structural steel shall be performed by operators who have been recently qualified as prescribed in "Qualification Procedures" of the American Welding Society (AWS). Refer to Section 05 05 23.

1.5 SUBMITTALS

A. Shop Drawings:

1. Prepare and submit complete erection and detailed shop drawings for Engineer's approval, including framing plans indicating size, weight, and location of all structural members. Shop drawings shall indicate methods of connecting, anchoring, fastening, bracing, and attaching work of other trades.

    a. Where contract documents indicate verify in field (VIF) dimensions, shop drawings shall indicate these dimensions and Contractor shall note the dimensions have been verified.
    b. This specification modifies AISC Code of Standard Practice by deleting the following sentence from 4.4.1(c): "Release by the Owner's Designated Representatives for Design and Construction for the Fabricator to begin fabrication using the approved submittals." Review of the shop drawings by the Engineer shall not relieve the fabricator of this responsibility.

2. Furnish both the Engineer and Architect with one copy of the following:

    a. Final shop drawings containing all review notations.
    b. Field Use/For Construction drawings.

3. The steel fabricator shall submit a setting plan for all embedded items for Engineer's approval.
4. Prepare and submit for approval structural calculations for all structural steel connections. Calculations shall be sealed by a Professional Structural Engineer licensed in the State the project is located.
5. Welder's Certification: Submit certification for all welders employed on the project demonstrating they have been AWS qualified to perform the welding procedures required for this project.
6. General Contractor/Construction Manager to provide copies of field concrete cylinder breaks indicating the concrete meets 75% of the design compressive strength to the steel erector.

B. The General Contractor/Construction Manager shall conduct a field survey of as-built anchors and bearing plate locations and elevations prior to steel erection. Survey shall be furnished to the steel fabricator. Contractor shall identify deviations from approved shop drawings and submit proposed repairs and modifications to the Engineer and steel fabricator for approval.

C. Product Data:

1. Certified copies of material test reports, commonly called mill test reports, for all structural steel used on the project. Material test reports shall comply with the requirements of ASTM A6, shall cover chemical and physical properties, and shall be accompanied by a Certificate of Compliance from the fabricator.
2. Manufacturer specifications, certifications, and installation recommendations for the following products, including laboratory test reports and other data required to prove compliance with these specifications:

    a. High strength bolts, including nuts and washers.
    b. Unfinished bolts and nuts

3. The Contractor shall submit written procedures for the pre-installation testing, installation, snugging, pretensioning, and post-installation inspection of fasteners. The procedure(s) shall meet all requirements of the RCSC specification and the drawings. Procedures need to be submitted only for the method(s) of installation to be used by the Contractor, which may include the turn-of-nut, calibrated wrench, twist-off type tension control bolt, and direct tension indicator methods.
4. Prepare and submit product data for Engineer's approval forshop applied primers, finished paint system, expansion and/or adhesive anchors, non-shrink grout and other miscellaneous materials.

1.6 DELIVERY, STORAGE AND HANDLING

A. Steel members shall be transported, stored, and erected in a manner that will avoid any damage or deformation. Materials should be stored to allow easy access for inspection and identification. Bent or deformed members will be rejected and shall be replaced or repaired at the expense of the responsible party. Store clear of the ground and in such a manner as to eliminate excessive handling.

B. Store fasteners in a protected location. Clean and re-lubricate bolts and nuts before use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel:

1. All structural steel shall be free from defects impairing strength, durability, or appearance. All structural steel shall meet the latest minimum requirements as follows:

a. Structural steel wide flange shapes shall:

1) Conform to the ASTM designations listed in the General Notes of the drawings, unless noted otherwise.
2) All "Heavy Section" column flanges located at welded moment connections shall be ultrasonically examined, prior to welding, for evidence of laminations, inclusions, or other discontinuities in accordance with ASTM A435 or ASTM A898 as applicable and along beams, 6 inches past the end of the joint assembly. The area to be tested is a zone 6 inches above and below each beam flange connection. For plates, any discontinuity causing a total loss of back reflection that cannot be contained within a circle the diameter of which is 3 inches, or one-half the plate thickness, whichever is greater, shall be rejected.
3) If beams in the Seismic-Force-Resisting-System (SFRS) are moment-connected to the weak axis of the column, the column web shall be similarly examined to the above criteria.
4) Grade 50 steel shall have a minimum yield stress of 50 ksi and the yield stress, Fy, that is reported from tests shall be based on the yield strength definition in ASTM A370, using the offset method at 0.002 strain.

b. Structural steel angles, channels, bars, plates and miscellaneous steel shall conform to the ASTM designations listed in the General Notes of the drawings.
c. Square and rectangular structural tubing shall be cold formed conforming to the ASTM designations listed in the General Notes of the drawings.

B. High Strength Structural Bolts:

1. High strength structural bolts shall conform to the ASTM designations listed in the General Notes of the drawings.
2. High strength bolts shall be detailed and installed in accordance with AISC - "Specification for Structural Joints Using High-Strength Bolts."
3. Manufacturer's symbol and grade markings shall appear on all bolts and nuts.

C. Anchoring Devices:

1. Anchor Rods: Anchor rods used with structural steel members shall be plain threaded rods conforming to the ASTM designations listed in the General Notes of the drawings.
2. Expansion Anchors: Expansion anchors shall consist of one-piece wedge type carbon steel anchors with heavy-duty nuts and washers. All components shall be zinc plated in accordance with ASTM B633. Refer to the drawing details and General Notes for the expansion anchors used as the basis of design and the acceptable alternates.
3. Adhesive Anchoring System: Adhesive anchoring system shall consist of a threaded anchor rod complete with nut and washer and the adhesive cartridge. Refer to the drawing details and General Notes for the adhesive anchoring systems used as the basis of design and the acceptable alternates.

a. Nuts shall meet ASTM A563, Grade DH, and washers shall meet ASTM F436.
b. All components shall be zinc plated in accordance with ASTM B633 SC1.
c. Adhesive shall consist of a two-part acrylic based adhesive applied in a dual cartridge dispensing system that properly mixes the components at the point of application.

D. Welding Materials:

1. Type required for material being welded in conformance with AWS D1.1.

E. Galvanizing: Where indicated on the drawings, steel shall be galvanized by the hot-dip process after fabrication conforming to ASTM A123. All exterior steel that will remain exposed shall be galvanized, unless otherwise indicated.

F. Paints and Primers:

1. Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer.
2. Galvanizing repair paint: SSPC Paint 20.

G. Non-Shrink Grout for Base and Bearing Plates: Non-shrink grout, conforming to ASTM C1107, shall be pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sand, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents. All constituents shall meet the requirements of these specifications. Minimum compressive strength at 28-days shall be 7,000 psi as determined by ASTM C109. Follow manufacturer's instructions for handling, mixing, placing, and curing. Acceptable products are:

1. Euclid Chemical Company - Euco N.S. Grout
2. L&M Construction Chemical - Crystex.
3. Master Builders - Masterflow 713.
4. Sonneborn - Sonnogrout.
5. Five Star Products Inc. - Five Star Grout.
6. Dayton Superior - Sure-Grip High Performance Grout.
7. Dayton Superior - 1107 Advantage Grout.

2.2 FABRICATION AND MANUFACTURE

A. Fabrication Procedures (non-AESS):

1. Fabricate all structural steel items in accordance with AISC Specifications and as indicated on the approved shop drawings.
2. Provide camber in structural members where indicated.
3. Properly mark materials for field assembly and location for which intended. Fabricate for delivery sequence that will expedite erection and minimize handling of materials.
4. Complete structural steel assemblies before shop priming or galvanizing.

B. Architecturally Exposed Structural Steel (AESS):

1. Prepare AESS surfaces according to Table 10.1 in the AISC Steel Design Manual, unless noted otherwise.

    a. Fabrication and erection tolerances, which are more stringent than required by the AISC Code of Standard Practice for Buildings and Bridges.
    b. Welded connections: Comply with AWS D1.1, AWD D1.8 and Section 05 05 23.

        1) Remove backing bars or run-off tabs; back-gouge and grind steel smooth.
        2) Remove erection bolts, fill holes, and grind smooth.
        3) Fill weld access holes and grind smooth.

    c. Requirements, if any, of a mockup of components for inspection and acceptance of standards prior to the start of fabrication.

C. Shop Connections:

1. All shop connections shall be welded, unless noted otherwise on drawings. Connections shall develop the full strength of the adjoining members unless detailed otherwise.
2. All holes shall be either drilled or punched, as no burning of holes will be permitted, including the enlargement of holes. Provide all holes required for connections and for attaching the work of other trades where such holes are shown if furnished prior to fabrication.
3. Connections shall be detailed as standard framed beam connections (bearing type) in accordance with the AISC Manual of Steel Construction. Connections which require oversized holes or slotted holes in which the force is other than normal to the axis of the slot shall be detailed as "Slip-Critical Connections" and noted as such on the erection drawings. Provide bearing plates and end anchorage for beams resting on masonry.
4. All full and partial penetration welds shall be fully detailed on the shop drawings. Use backing for all full penetration welds.
5. Weld access holes shall be fabricated in accordance with the recommendations of AWS D1.1 and AISC Specification.

D. Steel Stud Connectors:

1. Steel stud connectors for embedded plates and angles shall be welded in the fabrication shop in accordance with AWS D1.1.

E. Deck support framing and seats: Furnish all miscellaneous framing necessary to fully support the roof and floor steel decking.

F. Shop Priming:

1. Unless noted otherwise below, structural steel shall not be shop primed.
2. The following are steel surfaces to receive shop priming:

    a. Surfaces outside the building envelope that are not galvanized, including the following:

3. If the steel pieces are to be shop primed, the following surfaces are exceptions to shop priming:

    a. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
    b. Surfaces to be field welded.
    c. Surfaces to be high-strength bolted with slip-critical connections.
    d. Top flanges of beams supporting composite steel decking.
    e. Galvanized surfaces.

4. Surface Preparation: Clean Surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

    a. SSPC-SP 3, "Power Tool Cleaning."

5. Priming: Apply primer in accordance with paint manufacturer's recommendations, and at a rate recommended by SSPC to provide a dry film thickness of not less than15 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

G. Finished Paint System:

1. Finished paint coats shall be in accordance with paint manufacturer's recommendations and Division 9.
2. Paint shall be free of sags, runs, drips or other defects. Allow ample drying time before handling to prevent damage to coatings.
3. Strip paint corners, crevices, bolts, welds, and sharp edges.
4. Apply two coats of shop paint to surfaces that will be inaccessible after assembly or erection. Change color of the second coat to distinguish it from the first.

H. Galvanizing:

1. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123.

    a. Fill vent holes and grind smooth after galvanizing.
    b. Unless otherwise noted on drawings or in Division 9, all exterior steel components exposed to the elements shall be galvanized, including, but not limited to, lintels.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Erection Procedures:

1. The erector and not the Structural Engineer shall be responsible for the means, methods, and safety of erection of the structural steel framing.
2. Erection of all structural steel items shall meet the requirements of AISC "Specification and Code of Standard Practice."
3. All work shall be erected square, plumb, straight and true, accurately fitted and with tight joints and intersections, by mechanics experienced in the erection of structural steel. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
4. Clean the bearing surface and other surfaces that will be in permanent contact before assembly.
5. All base plates shall be supported on steel wedges, steel shims or heavy-duty leveling nuts until the supported members have been leveled and plumbed.

    a. Snug tighten anchor rods after supported members have been positioned and plumb. Do not remove wedges or shims but, if protruding, cut off flush with edge of base plate before packing with grout.
    b. Promptly place non-shrink grout between bearing surfaces and base plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturers written installation instructions for shrinkage-resistant grouts.

6. Field connections of structural work shall be made with either high strength bolts (bearing type) or by welding. Proper precaution shall be taken to ensure anchored items will not be distorted or overstressed due to improperly fabricated items.
7. Splice members only where indicated unless, with the Structural Engineer's approval, splices not indicated would result in lower costs due to reduced shipping expense. For splices not indicated, submit structural calculations prepared under direct supervision of and signed by a[Professional][Structural] Engineer licensed in the state where the project is located.
8. Do not use thermal cutting during erection unless approved by the Engineer/Architect in writing.
9. Steel erection shall not proceed without concrete in footings, piers, and walls attaining 75% of the intended minimum compressive design strength. Documentation must be provided indicating compliance with this requirement.

B. Surveys:

1. Establish permanent benchmarks necessary for accurate erection of structural steel.
2. Check elevations of concrete surfaces, and locations of anchor bolts and similar items, before erection proceeds.

C. Bracing and Protection:

1. Steel shall be well plumbed, leveled and braced to prevent any movement.

a. Contractor shall provide and maintain all necessary temporary guying of steel frame to safely resist all wind and construction loads during erection and to assure proper alignment of all parts of the steel frame.

2. Provide all temporary flooring, bracing, shoring and guards necessary to prevent damage or injury. All partially erected steel shall be secured in an approved manner during interruptions of work.

D. Anchor and Foundation Rods:

1. All anchor or foundation rods and similar steel items to be built into concrete or masonry are to be set by the concrete or masonry contractors and shall be furnished promptly so they may be built in as the work progresses because cutting of structural steel members to accommodate errors pertaining to embedded items will not be permitted.

3.3 FIELD WELDING

A. Welding Procedures:

1. All field welding shall be in accordance with AISC Specifications and conform to AWS D1.1 "Structural Welding Code - Steel".

a. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

3.4 REPAIRS, PROTECTION, AND TOUCH UP

A. Repair damaged galvanized coatings and on galvanized items with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

B. Touch up Painting: After installation, promptly clean, prepare, and prime or reprime field welds, final connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of the same type as shop primer used on adjacent surfaces.
3. Secure approval by the Architect prior to field painting.

3.5 GROUTING

A. Grouting under structural framing members shall be completed after all members have been plumbed and braced and before imposed loads are placed thereon.

B. Remove all defective concrete, dirt, oil, grease, and other foreign matter from surfaces to which grout will be placed.

3.6 MISCELLANEOUS STEEL AND STEEL LINTELS

A. Furnish and install all miscellaneous steel as detailed in architectural and structural drawings.

B. The steel fabricator shall furnish all steel lintels required for masonry wall construction indicated in the architectural and structural drawings and schedules.

C. Provide additional steel framing for continuous support of steel deck edges at openings and column interruptions.

D. All exterior exposed steel shall be hot-dip galvanized in accordance with ASTM A123 and painted in accordance with Division 9 after fabrication.

END OF SECTION 05 12 23

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SECTION 05 31 00 - STEEL DECK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fabrication and erection of steel deck. The Work shall include, but not be limited to the following:

1. Roof deck, roof deck accessories, and roof deck fasteners.
2. Composite floor deck.
3. Shear studs.

B. Structural notes indicated on the drawings regarding steel decking shall be considered a part of this specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 05 12 23 - Structural Steel.

D. Section 05 05 23 - Welding.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified. Where any provisions of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

1. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.
2. ASCE 9 - Standard for the Structural Design of Composite Slabs and Standard Practice for Construction and Inspection of Composite Slabs.
3. ASTM A36 - Standard Specification for Carbon Structural Steel.
4. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
5. ASTM A653 - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
6. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
7. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
8. AWS D1.1 - Structural Welding Code - Steel.
9. AWS D1.3 - Structural Welding Code - Sheet Steel.

10. SDI Roof Deck Design Manual.
11. SDI Floor Deck Design Manual.
12. SDI Diaphragm Design Manual.

1.4 QUALITY ASSURANCE

A. Fabricator: Company specializing in performing the work of this section with minimum five (5) years documented experience at manufacturing steel deck. Fabrication Company shall be a current member of the Steel Deck Institute (SDI).

B. Erector: Company specializing in performing the work of this section with minimum five (5) years documented experience at erecting steel deck.

C. Welding: Qualify Welding Procedure Specifications (WPS) and welding operator in accordance with AWS D1.3. Provide certifications that welders to be employed in the construction have satisfactorily passed AWS qualifications tests. If recertification of welders is required, retesting will be the contractor's responsibility.

D. Contractor to verify the manufacturer's steel deck type selected is listed on the UL fire rated roof assembly specified by the Architect for this project.

E. Furnish and install steel deck in accordance with the manufacturer's current ICC Research Committee Report to obtain diaphragm values indicated.

F. Contractor to have pre-installation meeting where installer demonstrates workmanship by conducting representative fastenings at pre-installation meeting, subject to guidance from mechanical fastener manufacturer representative.

1.5 SUBMITTALS

A. Prepare and submit shop drawings for Engineer's approval. Shop drawings shall indicate deck layout, depth, uncoated metal thickness, framing and supports with unit dimensions and sections, shear stud layout and complete end jointing. Contractor to verify measurements, lines, elevations, and details of field conditions to conform with actual conditions.

1. Provide details of all accessories.
2. Shop drawings shall also indicate typical welding or mechanical anchoring pattern for steel deck and accessories.

B. Prepare and submit allowable construction span tables and allowable total load tables for Engineer's approval. Tables shall be accompanied with a letter of certification from the manufacturer stating the tabulated design values were determined in accordance with the Steel Deck Institute's Design Manuals for Roof Deck, Floor Deck and Diaphragm Design.

1. The gauges and section moduli indicated on the drawings or specified herein are minimum and the gauge and section modulus of the deck furnished shall meet or exceed these minimum requirements. All gauges are United States standard, measured prior to coating.

C. WPS and Procedure Qualification Records (PQR) shall be current and approved by the Structural Engineer.

D. Provide manufacturer's latest recommendations and installation instructions.

E. Prepare and submit product data of proposed materials.

F. Drive pin fasteners: Provide manufacturer's product data sheets, test data sheets and deck diaphragm design load tables to demonstrate their product's capability to fasten the deck for the required structural loads.

G. After installation of drive pin fasteners is complete, manufacturer's representative to inspect fastener installation and provide written approval for installation of fasteners.

1.6 DELIVERY, STORAGE AND HANDLING

A. All decking materials shall be transported, stored, and erected in a manner that will prevent damage or deformation of sheets. Damaged material shall not be erected or repaired without Structural Engineer's approval.

B. Deck panels shall be stored clear of the ground, elevated on one end, and protected from weather with waterproof covering.

1.7 COORDINATION

A. Portions of decking to receive spray applied fireproofing shall be a galvanized finish. Contractor shall certify compatibility of any shop primer with field applied finishes or fireproofing required for this project.

PART 2 - PRODUCTS

2.1 STEEL ROOF DECK

A. Fabricate panels to comply with the "SDI Roof Deck Design Manual," and the following:

1. Steel decking sheet material, minimum yield strength, depth, gauge, profile, and finish are indicated on the drawings, as classified by the Steel Deck Institute (SDI). Panels shall be formed with integral ribs and overlapping side flanges.
2. Galvanized Steel Sheet: ASTM A653 Structural Steel (SS), Grade 40, with a G90 zinc coating conforming to ASTM A924 for galvanized deck.

2.2 COMPOSITE STEEL FLOOR DECK

A. Composite Steel Floor Deck: Fabricate panels with integrally embossed or raised pattern ribs to comply with the "SDI Floor Deck Design Manual," and the following:

1. Steel decking sheet material, minimum yield strength, depth, gauge, profile, and finish are indicated on the drawings, as classified by the Steel Deck Institute (SDI). Panels shall be formed with integral ribs and overlapping side flanges.

2. Galvanized Steel Sheet: ASTM A653 Structural Steel (SS), Grade 50 with a G60zinc coating conforming to ASTM A924 for galvanized deck.

2.3 FASTENERS

A. Support Fasteners:

1. Welded: Refer to the drawings for weld size and spacing requirements.

a. Shear studs may replace support fasteners. Refer to the drawings for requirements.

1) Provide headed stud type of cold finished carbon steel per Section 05 12 23 .
2) Use ferrules suitable for use with galvanized steel deck.

b. Weld metal shall penetrate all layers of deck material and shall have good fusion to the supporting steel. Fasten ribbed deck to steel support members at ends and intermediate supports.

1) All welding shall be in conformance with previously cited AWS recommendations in appearance and quality of welds, and the methods used in correcting welding work.

2. Screws: Zinc-coated, self-drilling, self-tapping (minimum No. 12) steel screws. Refer to the drawings for fastener spacing requirements.

B. Side Lap Fasteners:

1. Mechanical: Zinc coated self-drilling, self-tapping type (minimum No. 10)steel screws. Refer to the drawings for fastener spacing requirements.

2.4 ACCESSORIES

A. Steel materials to conform to ASTM A1008 meeting the requirements of ASTM A653, G60 coating.Provide all closers, fillers,starters, sump pans, metal cant strips, ridge and valley plates,column closures,girder fillers, and similar accessories required for a complete installation. Provide cover plates at all locations where direction of deck span changes. Unless otherwise noted, accessories shall be of the same steel sheet material, finish, and thickness as the deck sections.

B. Recessed Sump Pans: Single piece steel sheet of same material, finish, and thickness as the deck, with 3-inch-wide flanges and recessed pan of 1-1/2-inch minimum depth. Cut drain holes in the field.

PART 3 - EXECUTION

3.1 ERECTION

A. Verify field conditions are acceptable and are ready to receive work. Correct inaccuracies in alignment or level before deck units are finally placed.

B. Deck units and deck accessories herein specified shall be thoroughly and securely erected by experienced workmen fastening to supporting steel members specified. All work shall be in conformance with the manufacturer's latest printed recommendations and approved shop drawings.

C. Beginning of installation means installer accepts existing conditions.

D. The finished work shall be true, flat planes and to slopes indicated with end joints flush and without sharp protruding edges. Exposed underside of deck shall be true without defect.

E. Where large predetermined openings for elevators, stairs, ducts, and similar elements passing through the deck units occur, furnish prefabricated units to fit job conditions. Where other holes or openings are required in decking after erection, reinforce such holes as indicated on the drawings. Cantilever deck to the edge of slabs only as indicated on the drawings.

F. Burning of holes in decking will not be permitted.

G. Steel decking shall be installed to span supporting steel members at right angles. Panels shall be securely anchored to each structural support it rests on or passes.

H. Except where single spans are indicated, furnish decking in minimum lengths to span 3 spans with telescoping or nested 2-inch end laps and interlocking or nested side laps.

3.2 ROOF DECK

A. Fasten roof deck panels to steel supporting members using welds, and as specified herein and on the drawings.

B. Deck shall be fastened through the bottom of the deck rib to all structural supports for the specific deck sections.

C. End bearing of roof decking shall have a minimum of 1-1/2 inches of bearing occurring over structural supports.

D. Place deck panels on structural supports and adjust to final position with ends aligned. Attach to supports immediately after placement.

E. Roof sump pans shall be installed over openings provided in roof deck with flanges welded to the top of the deck. Space welds at 12 inches apart with at least 1 weld in each corner.

F. Install all roof deck accessories in accordance with the roof deck manufacturer's written instructions.

3.3 FLOOR DECK

A. Fasten floor deck panels to supporting steel with welds, shear studs as specified herein and on the drawings.

B. Unless noted otherwise, secure side laps and perimeter edges of units with fasteners at mid-span between supports or 36 inches on center, whichever distance is smaller.

C. Place deck panels on structural supports and adjust to final position with ends aligned. Attach to supports immediately after placement.

D. Install deck ends over supports with a minimum end bearing of 1-1/2 inches.

E. Install pour stops and girder fillers to supporting structure according to manufacturer's recommendations.

F. Fasten column closures and cell closures to deck to provide a tight fit. Provide cell closures at changes in direction of deck units, unless otherwise noted.

G. Install all floor deck accessories in accordance with the floor deck manufacturer's written instructions.

H. If steel stud shear connectors are being applied through the deck onto the structural steel for composite floor construction, the stud welds can be used to replace the specified puddle welds.

I. Composite deck sheets with steel shear stud connectors shall be butted over supporting members. Standard tolerance for ordered lengths is plus or minus 1/2 inch.

J. Steel studs connectors shall be installed only by certified operators who are thoroughly familiar with the installation equipment.

K. Steel stud connectors shall have complete fusion to the steel beams underlying the decking. Where repairs are made by fillet welding, such welding shall be between stud and beam, with removal of portions of the decking as required.

L. Where the decking is thick due to heavy gauge sheets or double sheets at cellular panels, holes in one or more sheets shall be made before stud welding when required to ensure fusion of steel stud connectors to beams. When such holes are not made, fusion shall be verified.

M. Ferrules shall be removed after completion.

3.4 FIELD TOUCH UP

A. After erection, all weld burn marks and abraded spots shall be cleaned and field painted with a rust-inhibiting metal primer matching formulations and color of shop coat or a zinc-rich rust inhibiting paint for galvanized deck surfaces.

END OF SECTION 05 31 00

SECTION 05 40 00 - COLD-FORMED STEEL FRAMING (CFSF) SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Load bearing structural steel stud, framing system of 18 to 12-gauge (43 mil to 97 mil) members along with fasteners and related accessories. Furnish and install cold-form steel framing, as shown on the drawings and specified herein. Work shall include, but not be limited to the following items:

1. Bearing and non-load bearing formed steel stud interior bearing wall framing].
2. Formed steel joist and truss framing and bridging.
3. Provide tracks, blocking, lintels, clips angles, bridging, shoes, reinforcements, fasteners, and accessories to construct a complete steel framing system.

B. Structural notes indicated on the drawings regarding cold-formed steel framing system shall be considered a part of this Specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.

B. Section 05 12 23 - Structural Steel.

C. Section 05 21 00 - Steel Joists.

D. Section 05 31 00 - Steel Deck.

E. Section 06 10 00 - Rough Carpentry.

F. Division 9 for non-load bearing studs of 20 gauge (33 mil) or lighter.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified. Where any provisions of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

1. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.
2. AISI S200 - North American Standard for Cold-Formed Steel Framing - General Provisions.
3. AISI S202 - North American Standard for Cold-Formed Steel Structural Framing.
4. AISI S210 - North American Standard for Cold-Formed Steel Framing - Floor and Roof System Design.
5. AISI S211 - North American Standard for Cold-Formed Steel Framing - Wall Stud Design.AISI S212 - North American Standard for Cold-Formed Steel Framing - Header Design.

6. AISI S213 - North American Standard for Cold-Formed Steel Framing - Lateral Design.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
9. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members.
10. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
11. AWS D1.3 - Structural Welding Code - Sheet Steel.
12. SSMA - Steel Stud Manufacturers Association.

1.4 QUALITY ASSURANCE

A. Workmen Qualifications:

1. For the actual erection of cold-formed steel framing system, use only skilled journeymen steel framing erectors who are thoroughly experienced with the materials and methods specified.
2. Use qualified welders and comply with AWS standards.

B. Design Qualifications:

1. Engage a fabricator who uses a qualified Professional Structural Engineer, licensed in the State where the trusses are to be installed, to prepare calculations, shop drawings and other structural data for the cold-formed steel framing system.

C. Manufacturer: Company specializing in performing the work of this section with a minimum of five (5) years documented experience at manufacturing cold-formed steel and framing systems and related accessories. Manufacturer shall be a current and "full" member of the Steel Stud Manufacturers Association (SSMA) or Steel Framing Industry Association (SFIA).

D. All cold-formed steel furnished under this section shall be supplied by a manufacturer who is a current member of the Steel Stud Manufacturers Association (SSMA) or Steel Framing Industry Association (SFIA).

1.5 SYSTEM PERFORMANCE REQUIREMENTS

A. Structural Performance:

1. Provide cold-formed steel framing (CFSF) capable of withstanding design loads indicated on the plans.
2. Design CFSF to withstand design loads meeting the following deflection limits:

a. Exterior walls backing up brick or stone veneer: Horizontal deflection of 1/600 of wall height.

b. Exterior walls clad with metal siding, exterior insulated finish systems or other flexible non-brittle finishes: Horizontal deflection of 1/360 of wall height.
c. Interior Load-Bearing Walls: Horizontal deflection of L/360 of wall height under 5 psf load.

3. Design CFSF to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120°°F.
4. Design system to accommodate construction tolerances, deflection of building structural members (1-inch maximum), and clearances of intended openings.
5. CFSF shall be designed in accordance with all AISI Standards.

1.6 SUBMITTALS

A. Shop Drawings:

1. Prepare and submit complete erection and detailed shop drawings for Engineer's approval, including framing plans indicating size, gauge, weight, and location of all framing members. Shop drawings shall indicate the following:

a. Component details, framed openings, bearing, anchorage, loading, welds, type and location of fasteners, bracing, bridging, strapping, connections, and accessories or items required of other related work. Provide stud layout.
b. Describe method for securing studs to tracks and for bolted/welded framing connections.
c. Provide calculations for loadings and stresses of the steel framing system, including specially fabricated components and roof trusses, prepared by a registered Professional Structural Engineer, with registration from the State in which the project is located.
d. Detail size and location of all bridging, strapping, bracing, splices, and accessories required for installation.

B. Product Data:

1. Provide product data on standard framing members. Describe materials and finish, product criteria and limitations. Submit manufacturer's installation instructions.

1.7 DELIVERY, STORAGE AND HANDLING

A. Steel members shall be transported, stored, and erected in a manner that will avoid any damage or deformation. Bent or deformed members will be rejected and shall be replaced or repaired at the expense of the responsible party. Store clear of ground and in such a manner so as to eliminate excessive handling.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Framing Materials:

1. Studs shall conform to the ASTM designations listed in the General Notes of the drawings, unless noted otherwise, and be formed to channel shape, punched web, with nominal size as indicated on the drawings.
2. Track shall be minimum 18 gauge (43 mil) thick sheet steel, channel shaped, solid web, same width as studs. Track shall provide a tight fit for studs.

B. Accessories:

1. Bracing, furring, and bridging shall consist of formed sheet steel with thickness determined for conditions encountered. Provide manufacturer's standard shapes, complete with finish same as framing members.
2. Plates, gussets, and clips shall consist of formed sheet steel with thickness determined for conditions encountered. Provide manufacturer's standard shapes, complete with finish same as framing members.

C. Fasteners:

1. Self-drilling, self-tapping screws, bolts, nuts, and washers shall conform to ASTM A90, complete with hot-dip galvanized coating, minimum size: 1/4-14.
2. Expansion anchors shall be "Kwik" bolts, as manufactured by Hilti, Inc.
3. All other fasteners shall be as indicated on drawings or as recommended by the cold-form manufacturer.
4. Welding connections are to be performed in accordance with American Welding Society (AWS) D1.3 "Structural Welding Code - Sheet Steel." Consult AWS D19.0 latest edition "Welding Zinc Coated Sheet" and ANSI Standard Z49.1 for information regarding welding procedures.

D. Finishes:

1. Furnish all studs, and system components with a factory galvanized (G60) finish.

2.2 FABRICATION

A. Fabricate assemblies of framed sections, of sizes and profiles required with framing members fitted, reinforced, and braced to suit design requirements.

B. Fit and assemble in largest practical sections for delivery to Worksite, ready for installation.

C. Bearing studs must be fabricated with full stud end seated against track web. Do not use studs that have been cut at punchouts.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify substrate surfaces and building framing components are ready to receive work.

B. Beginning of installation means acceptance of existing conditions and substrate.

3.2 INSTALLATION

A. General:

1. Cold-formed steel framing system shall consist of structural steel studsand with locations as shown on the drawings. All work shall be in accordance with approved shop drawings and manufacturer's latest printed specifications. Framing members shall be securely attached by fusion welding with fillet, plug, butt, or seam type welds][mechanical fasteners as indicated on the drawings and as recommended by the manufacturer.

    a. All field welding shall be in accordance with AWS previously cited.
    b. Wire tying of stud components will not be allowed.
    c. Complete framing system ready to receive subsequent facing material.

2. Provision shall be made in the studs for rigid fastening of all blocking and special braces or framing and for attachment and support of electrical outlets or other equipment indicated to be supported by stud construction.

    a. All anchorage, bracing and blocking shall be in accordance with approved shop drawings and as recommended by the manufacturer.

3. Surfaces abraded by handling, weld locations and other miscellaneous defects shall be touched-up with zinc-rich galvanizing compound (ZRC) coating.

B. Erection of Studding:

1. Top and bottom track members shall be the same size and gauge as the stud and be continuous for the total length of the framing system or as long as practical and shall be securely attached a maximum of 24 inches on center with approved fastening devices. Studs shall extend in one piece full height vertically between tracks, spaced no greater than 24 inches on center, with all web cut-outs in perfect alignment. Studs shall provide solid backing at corners and jambs. Install studs with all components properly aligned and braced with all work plumb and true, ready and acceptable to receive surface materials.

    a. Coordinate installation of sealant with floor and ceiling tracks.
    b. Field cutting of studs shall be done by sawing.
    c. Splices in axially loaded studs will not be permitted.
    d. Erect load bearing studs, brace and reinforce to develop full strength to meet design requirements.
    e. Extend stud framing through ceiling to underside of floor or roof structure above.

f. Install intermediate studs above and below openings with studs equally spaced to correspond to adjacent stud spacing.
g. Provide deflection allowance in stud track, directly below horizontal building framing for non-load bearing framing.
h. Framing fabricator shall ensure punchout alignment when assembling framing and field cutting to length.
i. All framing components shall be cut squarely for attachment to perpendicular members.
j. In the event a track butt joint occurs within a panel, abutting pieces of track shall be butt welded or spliced together. No such splices shall occur at any head or sill condition.

2. Steel studs shall be located not more than 2 inches from all door, abutting partitions, partition corners and other construction. Unless detailed otherwise, track or stud member shall be used as a runner over door frames. Structural studs shall be securely and rigidly anchored in place to give total and complete support to subsequent materials attached thereto. All studs shall be securely attached to jamb and head anchor clips of each door frame by manufacturer's recommended method.

END OF SECTION 05 40 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fabrication and erection of all metal items shown on the drawings and not specified under other sections. These include, but are not necessarily limited to the following:

1. Rough hardware, loose bearing plates, miscellaneous framing, bracing and supports.
2. Handrails, guardrails, and brackets.
3. Lintels, angles, clips, and plates.
4. Edge angles.
5. Miscellaneous bracing and brackets.
6. Pipe bollards.
7. Copings and gravel stops.
8. Ladders.
9. Structural support for ceiling hung toilet partitions.
10. Bolts, rods, dowels, nuts, washers, anchors, brackets and other miscellaneous iron.

B. Structural notes indicated on the drawings regarding any metal fabrication shall be considered a part of this specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.

B. Section 05 12 23 - Structural Steel.

C. Architectural metals and materials in Divisions 07, 08, 09 and 10.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards except where more stringent requirements are shown or specified. Where any provisions of other pertinent codes and standards conflict with this specification, the more stringent provisions shall govern.

1. AISC 303 - Code of Standard Practice for Buildings and Bridges.
2. AISC 341-10- Seismic Provisions for Structural Steel Buildings, including any Supplements.
3. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
4. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
5. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

6. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
7. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
8. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
9. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
10. ASTM F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength, Inch Dimensions.
11. AWS D1.1 - Structural Welding Code - Steel.
12. AWS D1.3 - Structural Welding Code - Sheet Steel.
13. AWS D1.8 -- Structural Welding Code - Seismic Supplement.
14. OSHA - Occupational Safety and Health Administration.

1.4 QUALITY ASSURANCE

A. Fabrication, Erection and Welding Qualifications:

1. Fabricate steel members in accordance with AISC Specifications for the design, fabrication, and erection of structural steel for buildings.
2. Steel fabricator shall not have less than five(5) years of continuous experience in fabrication of structural metal framing.
3. Steel erector shall not have less than five (5) years of continuous experience in the erection of structural metal framing.
4. All welding of structural steel shall be performed by operators who have been recently qualified as prescribed in "Qualification Procedures" of the American Welding Society (AWS).

B. Project Conditions: Do not fabricate components that require fitting to structural elements or into finished spaces until dimensions are verified at the jobsite.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

A. Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each metal fabrication.

1. Handrail and Guardrail Systems:

a. Concentrated force of 200 lb applied at any point in any direction.
b. Uniform force of 50 lb per linear foot applied in any direction.
c. Concentrated and uniform forces above need not be assumed to act concurrently.

2. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated force of 50 lb applied to one square foot at any point in the system including panels, intermediate rail balusters, or other elements composing the infill area.

    a. Above force need not be assumed to act concurrently with uniform horizontal forces on handrails or guardrails of railing systems in determining stress on guard.

3. Heavy Duty Metal Bar Gratings: Capable of withstanding a uniform force of 250 lb per square foot or a concentrated force of 8,000 lb, whichever produces the greater stress.
4. In general, for other types of conditions, limit deflection to 1/360 of span or 1/2 inch, whichever is less.

    a. Use concealed fasteners for semi-exposed work. Clearly indicate type and location of fasteners on submittal data.
    b. Connections: Bolt or weld at Contractor's option depending on substrates and field conditions involved.

1.6 SUBMITTALS

A. Prepare and submit shop drawings detailing the fabrication and erection of each metal fabrication indicated on architectural and structural drawings. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

    1. Where installed metal fabrications are indicated to comply with certain design loadings, include structural calculations, material properties, and other information needed for structural analysis that has been prepared and certified by a Professional Structural engineer licensed in the State where the project is located.
    2. Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

B. Product data, and installation instructions where applicable, for products used in miscellaneous metal fabrications, including paint products and grout.

C. Provide samples of materials and finished products requested by the Engineer.

D. Welder's Certificates: Submit certification for all welders employed on the project demonstrating they have been AWS qualified to perform the welding procedures required for this project.

1.7 DELIVERY, STORAGE AND HANDLING

A. Steel fabrications shall be transported, stored, and erected in a manner that will avoid any damage or deformation. Bent or deformed members will be rejected and shall be replaced or repaired at the expense of the responsible party. Store clear of ground and in such a manner so as to eliminate excessive handling.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:

1. All material shall conform with the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Where two or more identical articles are required, they shall be of the same manufacturer.
2. All metal surfaces shall be free from any defects which would impair the strength, durability, appearance, and shall be of the best commercial quality, for the purposes intended and adequate to withstand the strains and stresses to which they will be subject.

B. Miscellaneous Steel Shapes:

1. All miscellaneous metal, including structural steel shapes, miscellaneous plates, bars, and angles, shall conform to ASTM A36 unless noted.

    a. Square and rectangular steel tubing shall be hot formed conforming to ASTM A500, Grade B (minimum yield stress 46 ksi).
    b. Cold-rolled steel sheet shall conform to ASTM A1008.
    c. Steel pipe shall conform to ASTM A53, Grade B (minimum yield stress 35 ksi).
    d. Cast iron shall conform to ASTM A48, Class 30, minimum 30,000 psi tensile strength (gray) or ASTM A47 (malleable).

2. Galvanized Carbon Steel Sheets: ASTM A525, G90 zinc coating.
3. Cold-Finished Steel Bars: ASTM A108, grade as selected by fabricator.
4. Aluminum Castings: 214 aluminum alloy.
5. Aluminum Extrusions: 6053 aluminum alloy temper to suit.

C. Miscellaneous Related Materials:

1. Welding Electrodes: Conform to AISC and AWS D1.1.
2. Steel Primer Paint: Rust inhibitive primer exceeding the performance requirements of FS-TT-P-86d, Types I and II.
3. Hot-Dip Galvanizing: ASTM A123 or as applicable after fabrication.
4. Galvanizing Repair Paint: High zinc-dust content paint for re-galvanizing burned or abraded area on galvanized surfaces.

5. Non-Shrink Grout: Non-shrink grout, conforming to ASTM C1107, shall be pre-mixed, non-metallic, non-corrosive, non-staining product of 7,000 psi minimum compressive strength at 28-days.
6. Dry Pack: A cement-sand mix of 1 part Portland cement to 2-1/2 parts sand by volume with necessary water added to provide for solid compaction.
7. Gasket Material: Soft compressible neoprene rubber strip, thickness and width as required.
8. Filler Material for Welding Aluminum: Type 53.
9. Miscellaneous: All items of miscellaneous metal, including clip angles, ties, straps, anchors, bolts, angles, rods, and other appurtenances required for proper installations.

D. Anchoring Devices:

1. Bolts shall conform to ASTM A307, Grade A, complete with suitable nuts and washers.
2. High strength bolts, if required, shall conform to ASTM F3125, Grade A325 (minimum diameter 3/4 inch).
3. Expansion anchors, unless otherwise indicated, shall be zinc coated high tensile strength steel wedge type "Kwik bolts - Standard" as manufactured by Hilti Fastening Systems, Tulsa, Oklahoma.
4. Fasteners shall be of same material and finish of work to be fastened together.

2.2 FABRICATION AND MANUFACTURE

A. All miscellaneous metal items herein specified shall be shop fabricated to the required shapes and dimensions indicated on the drawings and approved shop drawings.

B. Fabricate work in shop to the largest assemblies practicable.

C. It shall be the Contractor's responsibility to verify all field conditions and dimensions prior to fabrication.

D. All work shall be fabricated with straight lines, sharp angles, smooth curves as detailed and shall meet the minimum requirements of the previously cited AISC publications.

E. Do not incorporate damaged or distorted materials into the work.

F. Finished members shall be free from kinks, twists, burrs, and open joints.

G. All joints shall be accurately made and tightly fitted with adequate fastenings. Joints exposed to weather shall be formed to exclude water.

H. Fastening shall be concealed where practical. Permanent shop fabricated fastenings or connections shall be welded. Do not use screws or bolts where they can be avoided.

I. All welding shall be done by certified, experienced operators.

J. Surfaces to be welded shall be well cleaned of paint and other foreign matter.

K. Galvanizing: Hot dip galvanized items shown on the drawings or specified to be galvanized after fabrication. Galvanize metal exposed to the exterior and all shelf angles.

1. ASTM A153 for galvanizing of iron and steel hardware.
2. ASTM A123 for galvanizing of rolled, pressed and forged steel shapes, plates, bars, and strips 1/8 inch thick and heavier.
3. ASTM A386 for galvanizing of assembled steel products.
4. Fill vent holes and grind smooth after galvanizing.

L. Shop Painting: Shop paint miscellaneous metal work, except those members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, galvanized surfaces, and surfaces to receive a spray applied fireproofing.

1. Remove scale, rust, and other deleterious materials before the shop coat of paint is applied. Clean off heavy rust and loose mill scale in accordance with SSPC SP 2 "Hand Tool Cleaning". Remove oil, grease and similar contaminants in accordance with SSPC SP 1 "Solvent Cleaning".
2. Apply one shop coat of metal primer paint to fabricated metal items.
3. Brush or spray on metal primer paint, at a rate to produce a uniform dry film thickness of 2.0 mils for each coat. Provide full coverage of joints, corners, edges, and all exposed surfaces.

2.3 LINTELS

A. Steel lintels shall be provided for all openings and recesses throughout the building, except where other types are indicated. Lintels, unless otherwise indicated, shall consist of steel angles (minimum 3-1/2 x 3-1/2 inches x 5/16 inch), provide one (1) for each 4 inches of wall thickness.

1. Lintels, unless otherwise indicated, shall have a minimum bearing of 8 inches at each end.

2.4 GRATED TRENCH COVERS

A. Provide steel grated trench covers where indicated on the drawings. Bearing bars shall extend in the direction of the span with ends of grating sections occurring directly over supports. Anchoring of grating shall be in a secure and substantial manner as indicated on approved shop drawings. Installed grating shall be at the elevations shown, free from warp or camber and present a level and even surface. Notching of bearing bars at supports to maintain elevations will not be permitted.

1. Provide full perimeter banding for each section of floor grate. Bands shall equal the depth of the grating.

2.5 TRENCH FRAMES

A. Furnish and install trench frames as shown on the drawings consisting of steel angles, sized to accommodate grating. Frames shall be of welded construction complete with anchors for embedment into concrete.

B. Where indicated on the drawings, modify existing trench frames to size indicated. Such work may require field welding and cutting. Provide new grates.

2.6 ANCHOR BOLTS

A. Furnish and install all anchor bolts required, including those for roof edge members, pump and motor bases, and similar areas. Anchor bolts shall be set in accordance with details and tolerances required.

PART 3 - EXECUTION

3.1 ERECTION

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until such detrimental conditions are corrected.

B. All metal fabrications work shall be erected as indicated on the drawings, as confirmed by field measurements and in accordance with approved shop drawings. Furnish erection bolts, wedges, temporary bracing, and all other required appurtenances for a complete installation. Work shall be set accurately in place and permanently fastened in a neat manner. The work shall be plumb, level, or to the slopes indicated. Contractor shall do all cutting, fitting and similar work required to properly assemble and install the Contractors work. Contractor shall furnish all sleeves, bolts, screws and anchors, expansion shields, and similar anchoring devices, for assembling and securing the work and shall do all drilling, tapping, cutting and all other required operations necessary for a complete installation.

1. Installation of shelf and relieving angles when attached to the structural frame shall be left loose until masonry coursing has been established, then members shall be rigidly and securely anchored in place.

C. All field welding shall be in accordance with AWS as previously cited.

D. Field splicing of fabricated items is not allowed, unless said items exceed standard shipping length or change of direction requires splicing. Mechanical splicing by means of wedges without full welding shall not be allowed.

E. All installed metal work shall be Engineer approved before being covered by subsequent materials.

F. Each fabricated item shall be complete with attachment devices as shown or required to completely install each item in a secure manner.

3.2 FIELD TOUCH UP

A. Immediately after erection and before subsequent materials placed, Contractor shall touch up all erection bolts, all field welds and all scratched or abraded areas in shop coat. All touch up areas shall be first cleaned and then painted using a matching rust-inhibitive paint in color and formulation to match shop coat.

END OF SECTION 05 50 00

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SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Dimensional lumber, minor timber framing, engineered wood products, APA rated sheathing, rooftop equipment bases, wood blocking, wood furring, cants, subflooring, underlayment, plywood backing panels, and building wrap.

B. Appropriate anchoring and/or fastening devices for wood members, as well as acceptable wood treatment.

C. Preservative and fire-retardant treatment of wood.

D. Structural notes indicated on the drawings regarding rough carpentry shall be considered a part of this specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 04 22 00 - Reinforced Unit Masonry.

D. Section 05 12 23 - Structural Steel.

E. Section 05 50 00 - Cold-Formed Steel Framing (CFSF) System.

F. Section 06 17 53 - Metal Plate Connected Wood Trusses.

G. Section 09 90 00 - Paints and Coatings: Field Finishing.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards except where more stringent requirements are shown or specified. Where any provision of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

1. APA PRP-108 - Performance Standards and Qualification Policy for Structural-Use Panels.
2. AQMD - Local Air Quality Management District Regulations.
3. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A653 - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.
5. ASTM D245 - Standard Practice for Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber.

6. ASTM D5516 - Standard Test Method for Evaluating the Flexural Properties of Fire-Retardant Treated Softwood Plywood Exposed to Elevated Temperatures.
7. ASTM D5664 - Standard Test Method for Evaluating the Effects of Fire-Retardant Treatments and Elevated Temperatures on Strength Properties of Fire-Retardant Treated Lumber.
8. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
9. AWC - Manual for Engineered Wood Construction.
10. AWPA M4 - Standard for the Care of Preservative-Treated Wood Products.
11. AWPA P5 - Standard for Waterborne Preservatives.
12. AWPA P17 - Fire-Retardant Formulations.
13. AWPA T1 - Use Category System: Processing and Treatment Standard.
14. AWPA U1 - Use Category System: User Specification for Treated Wood.
15. NDS - National Design Specification for Wood Construction with Commentary.
16. NDS Supplement - National Design Specification Values for Wood Construction.
17. NIST PS 1 - Structural Plywood.
18. NIST PS 2 - Performance Standard for Wood-Based Structural-Use Panels.
19. NIST PS 20 - American Softwood Lumber Standard.

1.4 QUALITY ASSURANCE

A. Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

B. Preservative and fire-treated lumber: Shall be identified by the Quality Mark of an approved inspection agency in accordance with the California Building Code, and Title 24.

C. Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product through one source from a single producer.

D. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":

1. Dimensional lumber
2. Laminated-veneer lumber
3. Parallel-strand lumber
4. Prefabricated wood I-joists
5. Rim boards
6. Miscellaneous lumber

1.5 SUBMITTALS

A. Submit product data for each distinct product specified.

1. Submit product data and current ICC Evaluation Reports for framing anchors.

B. Material certificates for dimensional lumber specified to comply with minimum allowable unit stresses indicated on the documents. Indicate species and grade selected for each use, and design values approved by American Lumber Standards Committee.

C. Wood treatment data as follows, including chemical treatment manufacturer's warranty and instructions for handling, storing, installing, and finishing treated materials:

1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standard.
2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to the project site.
3. For fire-treated wood products, include certification by treating plant that treated materials comply with specified standards and other requirements as well as data relative to bending compliance from a treating plant stating the size and quantity of lumber treated and the type, moisture content, chemical content, manufacturer, and amount of treatment. Test according to ASTM D5516 and D5664.

1.6 DELIVERY, STORAGE AND HANDLING

A. All lumber shall be delivered, piled, and handled to protect it from warping due to excessive moisture or damage. Lumber shall be stored off the ground and under a waterproof cover properly fastened down to resist wind forces.

B. All installed exposed wood roof nailers, cants, curbs, and similar items shall be protected from moisture until covered with subsequent roofing materials or flashings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber Standards:

1. Dimensional Lumber: Comply with PS 20 and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

a. Each piece of lumber to be factory marked with grade, producing mill and the agency providing inspection services. Where exposed lumber is indicated to have a natural finish or receive stain, grade stamp to be located on the end or back of each piece.
b. Moisture content not to exceed 19% for kiln-dry or air-dry lumber.

2. Wood Structural Panels:

a. Comply with PS 1 or PS 2.
b. Comply with CBC Section 2306.2.

B. Grade and Species:

1. Provide dimensional lumber of any species, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to the "National Design Specification for Wood Construction" and its "Supplement."

C. Lumber grading rules shall be obtained from one of the following agencies:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority.
3. NSLB - Northern Softwood Lumber Bureau.
4. RIS - Redwood Inspection Services.
5. SPIB - Southern Pine Inspection Bureau.
6. WCLIB - West Coast Lumber Inspection Bureau.
7. WWPA - Western Wood Products Association.

D. When nominal sizes are indicated, provide actual sizes required by PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

2.2 DIMENSIONAL LUMBER

A. Beams,rafters: Refer to the drawings for material specifications.

B. Exterior and bearing wall framing: Refer to the drawings for material specifications.

C. Non-load bearing partitions: Standard, stud, or No. 3 of mixed Southern Pine, Hem-Fir, Hem-Fir (North), or Spruce-Pine-Fir.

D. Non-load bearing ceiling joists: Standard, stud, or No. 3 of mixed Southern Pine, Hem-Fir, Hem-Fir (North), or Spruce-Pine-Fir.

E. Exposed framing indicated to be a natural finish or receive stain: Provide material free from imperfections with uniformity of appearance. Refer to the drawings for material specifications.

2.3 ENGINEERED LUMBER

A. Engineered lumber shall contain no urea formaldehyde.

B. Provide engineered lumber capable of supporting required loads and meeting or exceeding the bending stress and modulus of elasticity as designated on the drawings.

C. Manufacturers:

1. Subject to compliance with design requirements and material properties as indicated on the drawings.

2.4 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA T1 and AWPA U1.

1. Preservative Chemicals:

    a. Alkaline Copper Quat (ACQ-C and ACQ-D)
    b. Inorganic Boron (SBX)
    c. Copper Azole (CBA-A and CA-B)

2. Wood treatment plant shall be experienced in performing work of this section, have specialization in treatment of wood similar to that required for this project, and be licensed by the manufacturer.

B. Kiln dry material after treatment to a maximum moisture content of 19 percent for lumber and 18percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

D. All treated items shall bear an end tag or permanent ink stamp indicating the following:

1. Identification of treating manufacturer.
2. Type of preservative used.
3. Minimum preservative retention (pcf).
4. End use for which the product is treated.
5. Identity of the accredited inspection agency.
6. Standard to which the product is treated.

E. Application: Contractor to treat wood in accordance with AWPA Standard U1. Provide treated wood materials as indicated on the drawings and at the locations recommended by the following Use Categories:

1. UC1 represents elements exposed to termites. Locations and/or elements are:
2. UC2 represents elements exposed to insects and/or in contact with concrete or high humidity. Locations and/or elements are:

    a. Interior framing plywood subfloor, and roof framing
    b. Millwork or trim touching concrete
    c. Sill plates

2.5 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-retardant treatment shall comply with AWPA Standard U1.

1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures when tested by a qualified independent testing agency according to ASTM D5664 for lumber and ASTM D5516 for plywood.
2. Use treatment that does not promote corrosion of metal fasteners.
3. Wood treatment plant shall be experienced in performing work of this section, have specialization in treatment of wood similar to that required for this project, and is licensed by the manufacturer.

B. Kiln dry material after treatment to a maximum moisture content of 19 percent for lumber and 18percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, bleed through, or otherwise adversely affect finishes.

D. All treated items shall bear an end tag or permanent ink stamp indicating the following:

1. Identification of treating manufacturer.
2. Name of fire-retardant treatment used.
3. Species of wood treated.
4. Flamespread and smoke-developed index.
5. Method of drying after treatment.
6. Identity of the accredited inspection agency.
7. Standard to which the product is treated.

E. Application: Provide treated wood materials as indicated on the drawings.

2.6 WALL SHEATHING

A. Plywood Wall Sheathing:

1. Exposure Durability: As indicated on the drawings.
2. Span rating: As indicated on the drawings.
3. Thickness: As indicated on the drawings

B. Oriented-Strand-Board Wall Sheathing:

1. Exposure Durability: As indicated on the drawings.
2. Span rating: As indicated on the drawings.
3. Thickness: As indicated on the drawings.

2.7 ROOF SHEATHING

A. Plywood Roof Sheathing:

1. Exposure Durability: As indicated on the drawings.
2. Span Rating: As indicated on the drawings.
3. Thickness: As indicated on the drawings.
4. Veneer Grade: As indicated on the drawings.

2.8 PLYWOOD BACKING PANELS

A. Backing Panels for Telephone and Electrical Equipment: PS 1, Exposure 1, C-D Plugged, fire-retardant treated. Provide thickness as indicated or, if not indicated, not less than 1/2 inch thick and not less than 12 inches beyond size of panel.

2.9 TIMBER

A. For timber of 5-inch nominal size and thicker, provide material complying with the following requirements:

1. Species and Grade: As indicated on the drawings.
2. Additional Restriction: Free of heart centers.

B. MISCELLANEOUS LUMBER Grounds, Nailers, Rooftop Equipment Bases and Curbs, Blocking, Cants, and Shims: Spruce-Pine-Fir.

C. Wood preservative treatment for wood plates, curbs, cleats, nailing strips, cants, blocking, nailers, and similar items for roof deck construction shall be ACQ or other non-arsenate based preservative. Conform to CBC Section 2303.1.9.1 and AQMD, Local Regulations.

1. Oil based preservatives, such as creosote or pentachlorophenol types are not acceptable.
2. Paint surfaces, which are cut after treatment with a concentrated solution of the treatment.

2.10 MISCELLANEOUS FASTENING REQUIREMENTS

A. Furnish and install all fasteners and anchoring devices for entire project, which shall include items such as nails, screws, bolts, anchors, and similar items. Common nails shall be used for all fastening in rough carpentry. Exterior exposed nails and screws shall be hot-dip galvanized. Bolts shall have standard threads and be complete with washers and nuts.

1. Lumber attached to metal decking shall be anchored directly with two rows of 1/4 inch diameter bolts or sheet metal lag screws spaced not greater than 24 inches on center for each row.
2. Wood assemblies such as wood curbs, top nailers, and other built-up members shall be anchored with common nails or wood screws having at least 1-1/2 inch anchoring penetration spaced in two staggered rows at 24 inches on center for each row.
3. Miscellaneous nailing shall be at the Contractor's discretion for a secure and tight installation.
4. Pre-drill holes for all nails larger than 20d. Field drill bolt holes for proper matching and bearing.
5. Lead holes for lag screws shall be installed as per NDS. Lag screws shall be screwed and not driven into place.
6. Bolts shall be installed in holes bored with a bit 1/16 inch larger than the diameter of the bolt. Bolts and nuts seating on wood shall have cut steel washers under heads and nuts. Nuts shall be pulled tight and again checked and tightened just prior to enclosing bolted members. Counterbore for bolted heads or nuts only where so indicated on the drawings, and then only to sufficient depth to house the bolt or head or nut and washer. Cut off excessive bolt projection where necessary. Nick threads to prevent loosening.

2.11 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

B. Where rough carpentry is exposed to weather, in ground contact, used in treated wood, or in areas of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153 of Type 304 stainless steel.

C. Nails, Brads, and Staples: ASTM F 1667and comply with CBC Section 2311A.

D. Power-Driven Fasteners: ESR 1539.

1. Use of machine nailing is subject to a satisfactory jobsite demonstration for each project and approval by the District Representative and the Division of the State Architect. Approval is subject to continued satisfactory performance. Machine nailing will not be approved in 5/16" plywood. If nail heads penetrate outer ply more than would be normal for a hand hammer or if minimum allowable edge distances are not maintained, performance will be deemed unsatisfactory.

E. Wood Screws: ASME B18.6.1.

F. Screws for Fastening to Cold-Formed Metal Framing: ASTM C954 and comply with except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

G. Lag Bolts: ASME B18.2.1.

H. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

I. Metal Framing Anchors

1. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:

a. Approved Manufacturers:

1) KC Metal Products, Inc.
2) Simpson Strong-Tie
3) MiTek USP

b. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.

c. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, which meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.12 MISCELLANEOUS MATERIALS

A. Building Paper: Asphalt-saturated organic felt complying with ASTM D226, Type I (No. 15 asphalt felt), unperforated.

B. Building Wrap: Air-retarder sheeting made from polyolefins; cross-laminated films, woven strands, or spun-bonded fibers; coated or uncoated; with or without perforations; and complying with ASTM E 1677, Type I.

1. Thickness: Not less than 3 mils.
2. Permeance: Not less than 10 perms.
3. Flame-Spread Index: 25 or less per ASTM E 84.
4. Allowable Exposure Time: Not less than three months.

C. Building Wrap Tape: Pressure-sensitive plastic tape recommended by building wrap manufacturer for sealing joints and penetrations in building wrap.

D. Sheathing Tape: Pressure-sensitive plastic tape for sealing joints and penetrations in sheathing and recommended by sheathing manufacturer for use with type of sheathing required.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. CABO NER-272 for power-driven fasteners.
2. Published requirements of metal framing anchor manufacturer.

E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

F. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

G. All installed wood roof nailers, cants, curbs, and similar items shall be protected from moisture until covered with subsequent materials or flashing.

3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor rods to formwork before concrete placement.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

1. Fire block furred spaces of walls, at each floor level and at ceiling, with wood blocking or noncombustible materials accurately fitted to close furred spaces.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal size furring horizontally and vertically at 24 inches o.c.

C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal size furring vertically at 16 inches o.c.

3.4 WOOD FRAMING INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's "Manual for Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions. The design provisions for solid sawn Douglas Fir lumber in the Code are applicable to laminated veneer lumber.

C. Do not splice structural members between supports, unless specifically detailed.

D. Maximum concentrated load on any joist to not exceed 100 pounds. Add joists when concentrated load exceeds this value.

E. Provide a minimum of three inches of bearing for dimensional lumber. Refer to the supplier requirements for bearing of laminated veneer lumber, unless noted otherwise.

F. Laminated veneer lumber beams shall be laterally supported at all points of bearing. Side mounted joist hangers, nailing to shoulder studs, and nailing of sheathing to beam will satisfy this requirement.

G. Nails installed parallel to the glue lines on the narrow face shall not be spaced closer than four inches for 10d common nails and three inches for 8d common nails.

H. Nails installed perpendicular to the glue lines on the wide face shall be installed in accordance with the Building Code. Assemble laminated veneer lumber beams with a minimum of three 16d nails per foot, fully penetrating each piece, unless noted otherwise.

I. Where built-up beams or girders of 2-inch nominal dimension lumber on edge are required, fasten together with 2 rows of 20d nails spaced not less than 32 inches o.c, staggered on opposite faces. Locate one row near top edge and another near bottom edge. Provide two (2) 20d nails at each end and at each splice.

1. For continuous members, stagger end joints at quarter points between supports locate end joints over supports.

3.5 WALL AND PARTITION FRAMING INSTALLATION

A. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs with headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.

3.6 CEILING JOIST AND RAFTER FRAMING INSTALLATION

A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal size or 2-by-4-inch nominal size stringers spaced 48 inches o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.

C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

3.7 TIMBER FRAMING INSTALLATION

A. Install timber with crown edge up and provide not less than 4inches of bearing on supports. Provide continuous members, unless otherwise indicated; tie together over supports if not continuous.

B. Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2-inch air space at sides and ends of wood members.

3.8 WOOD STRUCTURAL-USE PANEL INSTALLATION

A. General: Comply with applicable recommendations contained in APA "Engineered Wood Construction Guide" for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Sheathing: As indicated on the drawings.
2. Plywood Backing Panels: Nail or screw to supports.

3.9 SHEATHING TAPE APPLICATION

A. Apply sheathing tape to joints between sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

END OF SECTION 06 10 00

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing (at exterior metal stud walls).
2. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for plywood roof sheathing, general use plywood panels, and equipment backing panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
2. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

B. Factory mark panels to indicate compliance with applicable standard.

2.2 WALL SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corporation; GlasRoc.
b. Georgia-Pacific Building Products; Dens-Glass Gold.
c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
d. Temple-Inland Building Products by Georgia-Pacific; GreenGlass Exterior Sheathing.
e. United States Gypsum Company; Securock.

2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical or horizontal installation.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material approved by the manufacturer.

1. For roof and wall sheathing, provide fasteners.

B. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for

application indicated and complying with requirements for elastomeric sealants specified in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."

D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to metal framing with screws.
2. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
3. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

END OF SECTION 061600

SECTION 06 17 53 - METAL PLATE CONNECTED WOOD TRUSSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Engineering, fabrication, and erection of metal plate connected wood trusses to withstand the design loads as shown on the drawings and herein specified.

B. All fastening devices and bridging requirements related to the manufacture or erection of the wood trusses.

C. Structural notes indicated on the drawings regarding metal-plate-connected wood trusses shall be considered part of this specification.

1.2 RELATED WORK

A. Pertinent Sections of Division 01.

B. Section 04 22 00 - Reinforced Unit Masonry.

C. Section 05 12 23 - Structural Steel.

D. Section 06 10 00 - Rough Carpentry.

1.3 REFERENCES

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards except where more stringent requirements are shown or specified. Where any provision of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

1. AFPA - American Forest & Paper Association.
2. ANSI/TPI 1 - National Design Standard for Metal Plate Connected Wood Truss Construction.
3. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. AWC - Manual for Engineered Wood Construction.
5. BCSI - Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses.
6. NDS - National Design Specification for Wood Construction with Commentary.
7. NDS Supplement - National Design Specification Values for Wood Construction.
8. SBCA - Structural Building Components Association.
9. TPI - Truss Plate Institute.
10. WTCA - Wood Truss Council of America.
11. WTCA - Metal Plate Connected Wood Truss Handbook.

1.4 QUALITY ASSURANCE

A. Fabrication and Erection Qualifications:

1. Engage a fabricator who participates in a recognized quality-assurance program that involves inspection by Western Wood Products Association (WWPA), West Coast Lumber Inspection Bureau (WCLIB), or National Lumber Grades Authority (NLGA); Timber Products Inspection, Inc.; Truss Plate Institute (TPI); or other independent inspecting and testing agency acceptable to authorities having jurisdiction.

B. Forest Certification: Provide metal-plate-connected wood trusses produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

C. Design Qualifications:

1. Engage a fabricator who uses a qualified ProfessionalStructural Engineer, licensed in the State where the trusses are to be installed, to prepare calculations, shop drawings and other structural data for metal-plate-connected wood trusses.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

A. Trusses shall be designed in accordance with NDS, AFPA, TPI, WTCA and the local code of jurisdiction.

B. Comply with applicable requirements and recommendations of ANSI/TPI 1, "Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses" (BCSI), and "Metal Plate Connected Wood Truss Handbook" (WTCA).

C. Comply with applicable requirements of the "National Design Specification for Wood Construction" and it's "Supplement."

D. Single-Source Engineering Responsibility:

1. Provide trusses engineered by a metal-plate connector manufacturer to support superimposed dead and live loads indicated, with design approved and certified by a qualified [Professional][Structural] Engineer who is legally authorized to practice in the jurisdiction where the project is located and who is experienced in the design of metal-plate-connected wood trusses.

E. Structural Performance:

1. Design Loads: As indicated on the drawings.
2. Maximum Deflection Under Design Loads:

a. Roof Trusses: L/480] live load deflection and L/360 total load deflection.

1.6 SUBMITTALS

A. Product Data: For metal-plate connectors, metal framing anchors, bolts and fasteners.

B. Prepare and submit truss shop drawings and structural analysis calculations signed and sealed by the qualified ProfessionalStructural Engineer registered in the State where the project is located. Shop drawings and calculations shall include, but not be limited to, the following:

1. Building code used for design.
2. Plan detailing location.
3. Pitch, span, camber, configuration and spacing of each truss type.
4. Lumber species, sizes, and stress grades.
5. Metal connector plate type, size, and thickness.
6. Number of plies.
7. Required bearing details.
8. Location of all joints, splices, and support locations.
9. Design loads.
10. Adjustments to wood member or metal connector plate design values.
11. Maximum reactions and direction, including uplift reactions.
12. Truss-to-truss connections or truss field assembly requirements.
13. Deflection ratio.

1.7 DELIVERY, STORAGE, AND HANDLING

A. All metal-plate-connected wood trusses shall be stored clear of the ground to prevent deterioration or damage due to moisture, temperature changes, contaminants, and corrosion.

B. All items shall be transported, stored, and erected in a manner that will avoid any further damage or deformation. Bent or deformed items will be rejected and shall be replaced or repaired at the expense of the responsible party.

C. Handling during erection shall be in accordance with recommended practices set forth in BCSI's "Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber Standards:

1. Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee (ALSC) Board of Review.

B. Grade and Species:

1. Provide dimensional lumber of any species for truss chord and web members, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to NDS' "National Design Specifications for Wood Construction" and its "Supplement."

C. Metal Connector Plates:

1. Fabricate connector plates from structural-quality steel sheet, zinc coated by hot-dip process complying with TPI 1 and ASTM A653, G60 coating designation; Designation SS Grade 33 and not less than 0.036-inch coated thickness.

2.2 FASTENERS

A. Provide fasteners of size and type indicated that comply with requirements specified below for material and manufacture. Where truss members are exposed to weather or to high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A153 or of stainless steel, Type 304 or 316.

1. Nails, Wire, Brads, and Staples: FS FF-N-105.
2. Power Driven Fasteners: CABO NER-272.
3. Wood Screws: ASME B18.6.1.
4. Lag Bolts and Screws: ASME B18.2.1.
5. Bolts: Steel bolts complying with ASTM A307, Grade A (ASTM F568M, Property Class 4.6); with ASTM A563 hex nuts and where indicated, flat washers.
6. Expansion Anchors: Carbon steel anchor and sleeve assembly with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E488 conducted by a qualified independent testing and inspecting agency.

2.3 METAL FRAMING ANCHORS

A. Provide metal framing anchors with allowable design loads, as published by manufacturer, that meet or exceed those indicated, of the following metal and finish:

1. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653, G60 coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.

2.4 MISCELLANEOUS MATERIAL

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

2.5 FABRICATION

A. Assemble truss members in design configuration indicated using jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with the requirements of NDS and TPI.

B. Fabricate wood trusses in compliance with the requirements in NDS and TPI.

C. Connect truss members by metal connector plates located and securely embedded simultaneously by air or hydraulic press into both sides of wood members.

D. Trusses shall be fabricated in a properly equipped manufacturing facility of a permanent nature. Trusses shall be manufactured by experienced workmen, using precision cutting, jigging, and pressing equipment under the requirements of NDS and TPI.

E. Fabricate metal connector plates in sizes, configurations, thicknesses, and anchorage details as required to withstand design loads for types of joint designs indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install and brace trusses according to recommendations of TPI. Space trusses as indicated; install plumb, square, and true to line; and securely fasten to supporting construction.

B. Anchor trusses securely at all bearing points using metal framing anchors and fasten according to metal framing anchor manufacturer's fastening schedules and written instructions.

C. Securely connect each truss ply required for forming built-up girder trusses. Anchor trusses to girder trusses as indicated.

D. Install and fasten temporary and/or permanent bracing during truss erection and before construction loads are applied to prevent toppling. Anchor ends of permanent bracing where terminating at walls or beams.

E. Install wood trusses within installation tolerances required by TPI 1.

F. Cutting, removal, or altering of trusses is not permitted without written authorization from the Structural Engineer.

G. Return wood trusses that are damaged or do not meet requirements to fabricator and replace with trusses that do meet requirements.

3.2 REPAIR

A. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

END OF SECTION 06 17 53

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Section 06 41 16 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

1. GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
2. Section 12 36 61.16 “Solid Surfacing Countertops”.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products, high-pressure decorative laminate and cabinet hardware and accessories.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples:

1. Plastic laminates, for each color, pattern, and surface finish.

1.3 INFORMATIONAL SUBMITTALS

A. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

2. PRODUCTS

2.1 PLASTIC-LAMINATE-FACED-ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for quality and craftsmanship of architectural plastic-laminate cabinets indicated for construction. Components and materials are specified in this section and are not dictated by the AWI standard.

1. Provide certificates from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.

B. Grade: Custom.

C. Type of Construction: Frameless.

D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Abet Laminati, Inc.
b. Formica Corporation.
c. Lamin-Art, Inc.
d. Panolam Industries International, Inc.
e. Wilsonart International; Div. of Premark International, Inc.

F. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade VGS.
4. Pattern Direction: As directed by architect.

G. Materials for Semi-exposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS over Softwood Plywood, DOC PS 1, medium-density overlay
2. Drawer Sides and Backs: High-pressure decorative laminate, NEMA LD 3, Grade VGS over Softwood Plywood, DOC PS 1, medium-density overlay

3. Drawer Bottoms: High-pressure decorative laminate, NEMA LD 3, Grade VGS over Softwood Plywood, DOC PS 1, medium-density overlay Retain "Dust Panels" Paragraph below if required.

H. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.

I. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Match Architect's sample.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Composite Wood and Agrifiber Products: Products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
2. Softwood Plywood: DOC PS 1, medium-density overlay.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087100 "Door Hardware”.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.

C. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.

D. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

E. Shelf Rests: BHMA A156.9, B04013; metal.

F. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; epoxy-coated steel with polymer rollers.

2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
4. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100.

G. Door and Drawer Silencers: BHMA A156.16, L03011.

H. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Stainless Steel: BHMA 630.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

3. EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.

E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

END OF SECTION 06 41 16

SECTION 070150 - PREPARATION FOR REROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Full tear-off of existing roof system.
2. Removal of base flashings.
3. Temporary roofing.

B. Related Requirements:
1. Section 015000 "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for reroofing preparation.
2. Section 024119 “Selective Demolition” for removal requirements.
3. Section 074113 “Standing Seam Metal Roof Panels” for new roofing requirements and preparation.
4. Section 077100 “Roof Specialties” for auxiliary roofing related component installation and preparation.

1.3 UNIT PRICES

A. Work of this Section may be affected by a portion of existing unsuitable roof sheathing and replacement by unit price and allowance.

1.4 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

B. Full Roof Tear-Off: Removal of existing roofing system from deck surface up.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, sections, and details.

C. Temporary Roofing Submittal: Product data and description of temporary roofing system. If temporary roof remains in place, include surface preparation requirements needed to receive permanent roof, and submit a letter from roofing manufacturer, stating acceptance of the temporary roof and that its inclusion does not adversely affect the roofing system's resistance to fire and wind.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1. Include certificate that Installer is approved by warrantor of existing roofing system.
2. Include certificate that Installer is licensed to perform asbestos abatement.

B. Fastener pull-out test report.

C. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces that might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.

D. Landfill Records: Indicate receipt and acceptance of demolished roofing materials by a landfill facility licensed to accept them.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Reroofing Conference: Conduct conference at Project site.

1. Meet with Owner; Architect; Owner's insurer if applicable; testing and inspecting agency representative; roofing system manufacturer's representative; roofing Installer, including project manager, superintendent, and foreman; and installers whose work interfaces with or affects reroofing, including installers of roof deck, roof accessories, and roof-mounted equipment.
2. Review methods and procedures related to roofing system tear-off and replacement, including, but not limited to, the following:

    a. Reroofing preparation, including roofing system manufacturer's written instructions.
    b. Temporary protection requirements for existing roofing system components to remain.
    c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
    d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
    e. Existing roof deck conditions requiring notification of Architect.

f. Existing roof deck removal procedures and Owner notifications.
g. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
h. Structural loading limitations of roof deck during reroofing.
i. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
j. HVAC shutdown and sealing of air intakes.
k. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
l. Asbestos removal and discovery of asbestos-containing materials.
m. Governing regulations and requirements for insurance and certificates if applicable.
n. Existing conditions that may require notification of Architect before proceeding.

1.8 FIELD CONDITIONS

A. Existing Roofing System: Asphalt Shingled Roof

B. Owner will occupy all portions of building immediately below reroofing area. Conduct reroofing so Owner's operations are not disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

1. Coordinate work activities daily with Owner so Owner can place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
2. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below affected area. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.

C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

E. Conditions existing at time of inspection for bidding are maintained by Owner as far as practical.

1. Construction Drawings and Project Manual for existing roofing system are provided for Contractor's convenience and information, but are not a warranty of existing conditions. They are intended to supplement rather than serve in lieu of Contractor's own investigations. Contractor is responsible for conclusions derived from existing documents.

F. Limit construction loads on roof to 20 lbs./sq. in. for uniformly distributed loads.

G. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.

1. Remove only as much roofing in one day as can be made watertight in the same day.

H. Hazardous Materials: It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work. Existing roof will be left no less watertight than before removal.
2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

1.9 WARRANTY

A. Existing Warranties: There are no existing roofing system warranties in effect.

1.10 TEMPORARY PROTECTION MATERIALS

A. Expanded Polystyrene (EPS) Insulation: ASTM C 578.

B. Plywood: DOC PS1, Grade CD Exposure 1.

C. OSB: DOC PS2, Exposure 1.

1.11 TEMPORARY ROOFING MATERIALS

A. Design and selection of materials for temporary roofing are Contractor's responsibilities.

B. Sheathing Paper: Red-rosin type, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m).

C. Base Sheet: ASTM D 4601, Type II, nonperforated, asphalt-impregnated and -coated, glass-fiber sheet.

D. Glass-Fiber Felts: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt.

E. Asphalt Primer: ASTM D 41/D 41M.

F. Roofing Asphalt: ASTM D 312, Type III or IV.

G. Base Sheet Fasteners: Capped head, factory-coated steel fasteners, listed in FM Global's "Approval Guide."

1.12 INFILL AND REPLACEMENT MATERIALS

A. Use infill materials matching existing roofing system materials unless otherwise indicated.

1. Infill materials are specified in Section 074113 “Standing Seam Metal Roof Panels” unless otherwise indicated.

B. Wood blocking, curbs, and nailers are specified in Section 061053 Miscellaneous Rough Carpentry."

1.13 COVER BOARDS

A. Cover board materials are specified in Section 074113 “Standing Seam Metal Roof Panels”

1.14 AUXILIARY REROOFING MATERIALS

A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of existing and new roofing system.

PART 2 - EXECUTION

2.1 PREPARATION

A. Shut off rooftop utilities and service piping before beginning the Work.

B. Test existing roof drains to verify that they are not blocked or restricted. Immediately notify Architect of any blockages or restrictions.

C. Protect existing roofing system that is not to be reroofed and newly roofed areas still experiencing construction operations and maintenance traffic.

1. Loosely lay 1-inch- (25-mm-) minimum thick, expanded polystyrene (EPS) insulation over existing roofing in areas indicated. Loosely lay 15/32-inch (12-mm) plywood or OSB panels over EPS. Extend EPS past edges of plywood or OSB panels a minimum of 1 inch (25 mm).
2. Limit traffic and material storage to areas of existing roofing that have been protected.
3. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.

D. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

E. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

F. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing roofing system components that are to remain.

2.2 ROOF TEAR-OFF

A. General: Notify Owner each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.

B. Full Roof Tear-Off: Remove existing roofing and other roofing system components down to the roof decking.

1. Remove roof insulation and cover board. Including fasteners.
2. Remove wood blocking, curbs, and nailers.
3. Remove fasteners from all existing surfaces flush with substrate.

C. Air and Vapor Barrier: ASTM E 2178, roofing system manufacturer’s recommended air and vapor barrier for use as a temporary roof covering and installed per the roofing system manufacturer’s written instructions.

D. Existing Roof Substrate Primer: Roofing system manufacturer’s recommended low VOC product, installed according to the roofing system manufacturer’s written instructions.

E. Temporary Roof Covering Membrane Adhesive: Roofing system manufacturer’s recommended low VOC product, installed according to the roofing system manufacturer’s written instructions.

F. Base Sheet Fasteners: As recommended by the roofing system manufacturer and installed according to the roofing system manufacturer’s written instructions.

2.3 DECK PREPARATION

A. Inspect deck after tear-off of roofing system.

B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect. Do not proceed with installation until directed by Architect.

C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect. Do not proceed with installation until directed by Architect.

2.4 INFILL MATERIALS INSTALLATION

A. Immediately after roof tear-off, and inspection and repair, if needed, of deck, fill in tear-off areas to match existing roofing system construction.

1. Installation of infill materials is specified in Section 075416.
2. Installation of wood blocking, curbs, and nailers is specified in Section 061053 Miscellaneous Rough Carpentry."

B. Install new roofing patch over roof infill area. If new roofing is installed the same day tear-off is made, roofing patch is not required.

2.5 TEMPORARY ROOFING

A. Install approved temporary roofing over area to be reroofed per system manufacturer’s written instructions.

2.6 BASE FLASHING REMOVAL

A. Remove existing base flashings. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.

B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish, or as specified in Section 076200 "Sheet Metal Flashing and Trim."

C. Inspect sheathing, wood blocking, curbs, and nailers for deterioration and damage. If sheathing, wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.

D. When directed by Architect, replace framing, wood blocking, curbs, and nailers to comply with Section 061053 Miscellaneous Rough Carpentry."

2.7 DISPOSAL

A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

1. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 070150

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Polyisocyanurate foam-plastic board.
2. Mineral-wool blanket.
3. Loose-fill insulation.

B. Related Requirements:

1. Section 07 21 19 "Foamed-in-Place Insulation" for spray-applied polyurethane foam insulation.
2. Section 07 54 23 "Thermoplastic-Polyolefin (TPO) Roofing for insulation specified as part of roofing construction.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 POLYISOCYANURATE FOAM-PLASTIC BOARD

A. Polyisocyanurate Board, Foil Faced for vertical exterior faces of exterior concrete masonry unit walls and at below grade locations at perimeter foundation walls and below concrete slabs: ASTM C1289, foil faced, Type I, Class 1 or 2.

1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 MINERAL-WOOL BLANKETS

A. Mineral-Wool Blanket, Unfaced within interior metal stud walls as acoustic insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.

2.3 LOOSE-FILL INSULATION

A. Cellulosic-Fiber Loose-Fill Insulation at open cavities in exterior concrete masonry unit walls: ASTM C739, chemically treated for flame-resistance, processing, and handling characteristics.

2.4 ACCESSORIES

A. Insulation for Miscellaneous Voids:
1. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF SLAB INSULATION

A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 24-inches (610 mm) below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 24-inches (610 mm) in from exterior walls.

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Adhesive Installation: Install with adhesive or press into tacky waterproofing or damp proofing according to manufacturer's written instructions.

3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96-inches (2438 mm), support unfaced blankets mechanically.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

C. Loose-Fill Insulation: Apply according to ASTM C1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

1. For cellulosic-fiber loose-fill insulation, comply with CIMA's Bulletin #2, "Standard Practice for Installing Cellulose Insulation."

3.6 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 21 19 - FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Closed-cell spray polyurethane foam.

B. Related Requirements:

1. Section 07 21 00 "Thermal Insulation" for rigid board insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Evaluation Reports: For spray-applied polyurethane foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

A. Closed-Cell Spray Polyurethane Foam: ASTM C1029, Type II, minimum density of 2.0 lb/cu. ft. (32 kg/cu. m) and minimum aged R-value at 1-inch (25.4-mm) thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F (43 K x sq. m/W at 24 deg C).

1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Spray insulation to envelop entire area to be insulated and fill voids.

C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

D. Exterior Steel Entrance Canopies: Install into cavities formed by framing members, encompass all steel structural shapes, and at undersides of steel decking to achieve 4” minimum thickness.

E. Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.3 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION 07 21 19

SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
   1. Standing-seam metal roof panels.
   2. Gutters
   3. Downspouts
   4. Fascia
   5. Accessories

B. Related Sections:
   1. Section 072100 Thermal Insulation for rigid insulation above metal roof deck
   2. Section 074213.53 "Metal Soffit Panels" for metal panels used in horizontal soffit applications, to match roof panels.
   3. Section 077253 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface, allowing it to melt and drain off slowly.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

   1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
   2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
   4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
   5. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
   6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.

7. Review temporary protection requirements for metal panel systems during and after installation.
8. Review procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: [2.86 lbf/sq. ft. (137 Pa)][6.24 lbf/sq. ft. (300 Pa)].

B. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 60.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.

B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide Centria or comparable product by one of the following:

a. AEP Span; A BlueScope Steel Company.

b. Architectural Building Components.
c. Architectural Metal Systems.
d. CENTRIA Architectural Systems.
e. Dimensional Metals, Inc.
f. IMETCO.
g. McElroy Metal, Inc.
h. Metal-Fab Manufacturing, LLC.
i. Morin - A Kingspan Group Company.
j. Petersen Aluminum Corporation.

3. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

   a. Nominal Thickness: 0.028 inch (0.71 mm).
   b. Exterior Finish: Two-coat fluoropolymer.
   c. Color: As selected by Architect from manufacturer's full range.

4. Clips: One-piece fixed to accommodate thermal movement.

   a. Material: 0.028-inch-(0.71-mm-) nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.

5. Panel Coverage: 16 inches (406 mm).
6. Panel Height: 1.75 inches (44 mm).

2.3 UNDERLAYMENT MATERIALS

A. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

C. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch-(2400-mm) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c.,

fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.

D. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot-(3-m) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

E. Fascia: Formed from same material as roof panels and finished to match roof panels.

F. Panel Fasteners: Self-tapping screws designed to withstand design loads.

G. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.6 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:

1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

    a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 UNDERLAYMENT INSTALLATION

A. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.

B. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.4 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
4. Watertight Installation:

a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.

1. Provide elbows at base of downspouts to direct water as shown on drawings.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113.16

SECTION 074213.23 - METAL COMPOSITE MATERIAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
   1. Metal composite material wall panels.
   2. Soffit Vents

B. PREINSTALLATION MEETINGS

C. Preinstallation Conference: Conduct conference at Project site.

   1. Meet with Owner, Architect and Owner’s insurer if applicable, metal composite material panel Installer, structural-support Installer, and installers whose work interfaces with or affects metal composite material panels, including installers of doors, windows, and louvers.
   2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review methods and procedures related to metal composite material panel installation, including manufacturer's written instructions.
   4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
   5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal composite material panels.
   6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
   7. Review temporary protection requirements for metal composite material panel assembly during and after installation.
   8. Review procedures for repair of panels damaged after installation.
   9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal composite material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of metal composite material panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, tests performed by a qualified testing agency.

B. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal composite material panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal composite material panels, and other manufactured items so as not to be damaged or deformed. Package metal composite material panels for protection during transportation and handling.

B. Unload, store, and erect metal composite material panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal composite material panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal composite material panels to ensure dryness, with positive slope for drainage of water. Do not store metal composite material panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal composite material panels during installation.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal composite material panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

A. Coordinate metal composite material panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal composite material panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal composite material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).

B. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa).

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METAL COMPOSITE MATERIAL WALL PANELS

A. Metal Composite Material Wall Panel Systems: Provide factory-formed and -assembled, metal composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assembly components, and accessories required for weathertight system.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Alcoa Architectural Products (USA); Reynobond PE.
b. Alcotex Inc; Alcotex Aluminum Composite Material; PE Core.
c. ALUCOBOND; 3A Composites USA, Inc; Alucobond Plus.
d. Alucoil North America; Intrabond.
e. CENTRIA Architectural Systems; Formabond Wall System.
f. Firestone Metal Products, LLC; UNA-FAB Series 150.

B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch-(0.50-mm-)thick, coil-coated aluminum sheet facings.

1. Panel Thickness: 0.118 inch (3 mm).
2. Core: Standard.
3. Exterior Finish: Two-coat fluoropolymer.

a. Color: As selected by Architect from manufacturer's full range.

C. Attachment Assembly Components: Formed from extruded aluminum.

D. Attachment Assembly: Rainscreen principle system.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal composite material panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal composite material panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal composite material panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal composite material panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal composite material panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal composite material panels and remain weathertight; and as recommended in writing by metal composite material panel manufacturer.

F. Vents: Manufacturers standard vent inserts of size and locations as shown on drawings.

2.4 FABRICATION

A. General: Fabricate and finish metal composite material panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal composite material panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal composite material wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal composite material wall panel manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and assemblies penetrating metal composite material panels to verify actual locations of penetrations relative to seam locations of metal composite material panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal composite material panel manufacturer's written recommendations.

3.3 METAL COMPOSITE MATERIAL PANEL INSTALLATION

A. General: Install metal composite material panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor metal composite material panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal composite material panels.
2. Flash and seal metal composite material panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal composite material panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal composite material panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal composite material panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal composite material panel manufacturer.

D. Attachment Assembly, General: Install attachment assembly required to support metal composite material wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

E. Rainscreen-Principle Installation: Install using manufacturer's standard assembly with vertical channel that provides support and secondary drainage assembly, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with

fasteners recommended by manufacturer. Attach metal composite material wall panels by inserting horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.

1. Install wall panels to allow individual panels to be installed and removed without disturbing adjacent panels.
2. Do not apply sealants to joints unless otherwise indicated.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal composite material panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal composite material panel manufacturer; or, if not indicated, provide types recommended in writing by metal composite material panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal composite material wall panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal composite material panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal composite material panel installation, clean finished surfaces as recommended by metal composite material panel manufacturer. Maintain in a clean condition during construction.

B. After metal composite material panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal composite material panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.23

SECTION 07 42 93 - SOFFIT PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes metal soffit panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by the manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical roof eave, including fascia, and soffit as shown on Drawings; approximately eight panels wide by full eave width, including attachments and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/240 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METAL SOFFIT PANELS

A. General: Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners inside laps. Include accessories required for weathertight installation.

B. Flush-Profile Metal Soffit Panels: Solid panels formed with vertical panel edges and a flat pan between panel edges; with flush joint between panels.

1. Subject to compliance with requirements, provide products by one of the following.
   a. ATAS International, Inc.
   b. Berridge Manufacturing Company
   c. CENTRIA Architectural Systems
   d. Dimensional Metals, Inc.

2. Material: Same material, designated by Architect.

3. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.

    a. Nominal Thickness: 0.028 inch (0.71 mm).
    b. Exterior Finish: Mica fluoropolymer or Metallic fluoropolymer.
    c. Color: As selected by Architect from manufacturer's full range.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Sub-framing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or pre-molded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are non-staining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:
   1. Mica Fluoropolymer: AAMA 621. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   2. Metallic Fluoropolymer: AAMA 621. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

   1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.
   2. Examine sheathing to verify that sheathing joints are supported by framing or blocking, and that installation is within flatness tolerances required by metal panel manufacturer.

      a. Verify that air- or water-resistive barriers been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install sub-framing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

1. Soffit Framing: Wire tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
2. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
3. Copper Panels: Use copper, stainless-steel, or hardware-bronze fasteners.
4. Stainless-Steel Panels: Use stainless-steel fasteners.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.

3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

E. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling, and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in the manufacturers written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 93

SECTION 07 54 23 - THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Adhered thermoplastic polyolefin (TPO) roofing system.
2. Substrate board.
3. Vapor retarder.
4. Cover board.

B. Section includes installation of sound-absorbing insulation strips in ribs of roof deck. Sound-absorbing insulation strips are furnished under Section 05 31 00 "Steel Decking."

C. Related Requirements:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
2. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashing.
3. Section 07 71 00 "Roof Specialties" for manufactured copings and roof edge flashings.
4. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.4 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's

representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

B. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
1. Base flashings and membrane termination details.
2. Flashing details at penetrations.

3. Roof taper layout with finish slopes.
4. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.

C. Samples for Verification: For the following products:

1. Roof membrane and flashings, of color required.

D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturer, and testing agency.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

a. Submit evidence of compliance with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field Test Reports:

1. Concrete internal relative humidity test reports.
2. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

F. Field quality-control reports.

G. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, vapor retarder, walkway products, and other components of roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.

1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to UL 580, or UL 1897:

1. Zone 1 (Roof Area Field): Per Structural Drawings.
2. Zone 2 (Roof Area Perimeter): Per Structural Drawings.
3. Zone 3 (Roof Area Corners): Per Structural Drawings.

D. ENERGY STAR Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

E. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

F. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class C; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

G. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

A. TPO Sheet: ASTM D6878/D6878M, internally fabric- or scrim-reinforced, fabric-backed TPO sheet.

1. Carlisle Syntec Systems, Carlisle, PA
2. Firestone Building Products, Co., Carmel, IN
3. Versico Roofing Systems, Carlisle, PA
4. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.
5. Thickness: 60 mils (1.5 mm), nominal.
6. Exposed Face Color: White.

2.3 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as TPO sheet.

C. Bonding Adhesive: Manufacturer's standard.

D. Slip Sheet: ASTM D2178/D2178M, Type IV; glass fiber; asphalt-impregnated felt.

E. Slip Sheet: Manufacturer's standard, of thickness required for application.

F. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8-inch (25 by 3 mm) thick; with anchors.

G. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1-inch wide by 0.05-inch thick (25 mm wide by 1.3 mm thick), pre-punched.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone, and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 VAPOR RETARDER

A. Polyethylene Film: ASTM D4397, 10 mils (0.25 mm) thick, minimum, with maximum permeance rating of 0.076 perm (0.050 metric perm).

1. Tape: Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.
2. Adhesive: Manufacturer's standard lap adhesive.

2.5 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners with metal or plastic plates, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

1. Modified asphaltic, asbestos-free, cold-applied adhesive.
2. Bead-applied, low-rise, one-component, or multicomponent urethane adhesive.
3. Full-spread, spray-applied, low-rise, two-component urethane adhesive.

D. Cover Board: ASTM C1289 Type II, Class 4, Grade 1, 1/2-inch- (13-mm-) thick polyisocyanurate, with a minimum compressive strength of 80 psi (551 kPa).

E. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric; water permeable and resistant to UV degradation; type and weight as recommended by roofing system manufacturer for application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00 "Steel Decking."

4. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
5. Verify that joints in precast concrete roof decks have been grouted flush with top of concrete.
6. Verify that minimum curing period recommended by roofing system manufacturer for lightweight insulating concrete roof decks has passed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Perform fastener-pullout tests according to roof system manufacturer's written instructions.

1. Submit test result within 24 hours after performing tests.

    a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 INSTALLATION OF ROOFING, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.

C. Install roof membrane and auxiliary materials to tie into existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.

3.4 INSTALLATION OF SUBSTRATE BOARD

A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24-inches (610 mm) in adjacent rows.

1. At steel roof decks, install substrate board at right angle to flutes of deck.

    a. Locate end joints over crests of steel roof deck.

2. Tightly butt substrate boards together.
3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
4. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.5 INSTALLATION OF VAPOR RETARDER

A. Polyethylene Film: Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 and 6 inches (50 and 150 mm), respectively.

1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
2. Continuously seal side and end laps with tape or adhesive.

3.6 INSTALLATION OF COVER BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation or wood decking below a minimum of 6-inches (150 mm) in each direction.

1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
2. At internal roof drains, conform to slope of drain sump.

    a. Trim cover board so that water flow is unrestricted.

3. Cut and fit cover board tight to nailers, projections, and penetrations.
4. Loosely lay cover board over substrate.
5. Adhere cover board to substrate using adhesive, utilizing one of the following methods as recommended in writing by the membrane manufacturer:

    a. Set cover board in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.
    b. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing, and maintaining insulation in place.
    c. Set cover board in a uniform coverage of full-spread insulation adhesive, firmly pressing, and maintaining insulation in place.

B. Install slip sheet over cover board and beneath roof membrane.

3.7 INSTALLATION OF ADHERED ROOFING

A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll roof membrane and allow to relax before installing.

C. Start installation of roofing in presence of roofing system manufacturer's technical personnel and Owner's testing and inspection agency.

D. Accurately align roof membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.

F. Fabric-Backed Roof Membrane Adhesive: Apply to substrate at rate required by manufacturer and install fabric-backed roof membrane.

G. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.

H. Apply roof membrane with side laps shingled with slope of roof deck where possible.

I. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

J. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.8 INSTALLATION OF BASE FLASHING

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.10 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.11 ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: Village of Caseyville, IL
2. Address: 909 S. Main St., Caseyville, IL 62232.
3. Building Name/Type: Police Station Addition to the Village Hall.
4. Address: 909 S. Main St., Caseyville, IL 62232.
5. Area of Work: Roofing system.
6. Acceptance Date: _____.
7. Warranty Period: 20 years.
8. Expiration Date: _____.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

    a. lightning;
    b. peak gust wind speed exceeding 110 mph;
    c. fire;
    d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. vapor condensation on bottom of roofing; and
    g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 07 54 23

Section 07 62 00 - SHEET METAL FLASHING AND TRIM

1. GENERAL

1.1 WORK INLCUDES

A. Base Bid:
   1. General Contractor Provide:
      1) Formed roof-drainage sheet metal fabrications.
      2) Formed low-slope roof sheet metal fabrications.
      3) Formed wall sheet metal fabrications.
      4) Formed equipment support flashing.
      5) Formed overhead-piping safety pans.

B. Related Requirements:

   1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
   2. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, vents, and other manufactured roof accessory units.

1.2 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

   1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
   3. Review requirements for insurance and certificates if applicable.
   4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

D. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of typical roof cornice edge, including fascia, fascia trim and apron flashing, approximately 10 feet (3.0 m) long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.9 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

1) Color fading more than 5 Hunter units when tested according to ASTM D 2244.
2) Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
3) Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

2. PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:

1. Design Pressure: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 (Z275) coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275)]; prepainted by coil-coating process to comply with ASTM A 755/A 755M.

1. Surface: Smooth.
2. Exposed Coil-Coated Finish:

1) Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

3. Color: Match Architect's sample.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

1. Products: Subject to compliance with requirements, provide one of the following:

    1) Carlisle Commercial, a division of Carlisle Construction Materials; WIP 300HT.
    2) Grace Construction Products, a unit of W. R. Grace & Co.-Conn.; Grace Ice and Water Shield HT.
    3) Henry Company; Blueskin PE200 HT.
    4) Kirsch Building Products, LLC; Sharkskin Ultra SA.
    5) Metal-Fab Manufacturing, LLC; MetShield.
    6) Owens Corning; WeatherLock Specialty Tile & Metal Underlayment.
    7) Polyguard Products, Inc.; Deck Guard HT.
    8) Protecto Wrap Company; Protecto Jiffy Seal Ice & Water Guard HT.
    9) SDP Advanced Polymer Products Inc; Palisade SA-HT.

2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C) or higher.
3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C) or lower.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m)minimum.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

    1) Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC

sealing washers under heads of exposed fasteners bearing on weather side of metal.

2) Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

3) Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

3. Fasteners for Zinc Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Solder:

1. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead] [with maximum lead content of 0.2 percent.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

E. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

J. Do not use graphite pencils to mark metal surfaces.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof and Roof-to-Wall Transition Roof-to-Roof Edge-Flashing.
1. Aluminum: 0.050 inch (1.27 mm) thick.

B. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
1. Aluminum: 0.040 inch (1.02 mm) thick.

C. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm) thick.

D. Flashing Receivers: Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm) thick.

E. Roof-Penetration Flashing: Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

2.7 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

B. Overhead-Piping Safety Pans: Fabricate from the following materials:
   1. Galvanized Steel: 0.040 inch (1.02 mm) thick.

3. EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller. Cover underlayment within 14 days.

B. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).

2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel and aluminum sheet.
2. Do not pre-tin zinc-tin alloy-coated stainless steel and zinc-tin alloy-coated copper.
3. Do not use torches for soldering.
4. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

H. Rivets: Rivet joints in zinc where necessary for strength.

3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch (75-mm) centers.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.

1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch (400-mm) centers.
2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch (600-mm) centers.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints minimum of 4 inches (100 mm). Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

3.7 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

3.8 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.9 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 07 71 00 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Two-piece snap-on roof-edge fascia.
2. Roof-edge drainage systems.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for downspout guards and downspout boots.
2. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
3. Section 07 62 00 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
4. Section 07 72 00 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
5. Section 07 92 00 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

C. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties.

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.

C. Samples: For each type of roof specialty and for each color and texture specified.

D. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

E. Samples for Verification:

1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
2. Include copings, roof-edge specialties and roof-edge drainage systems made from 12-inch (300-mm) lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For each type of roof specialty.

C. Product Test Reports: For copings and roof-edge flashings, for tests performed by a qualified testing agency.

D. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are SPRI ES-1 tested to specified design pressure.

B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Section 07 54 23, “Thermoplastic-Polyolefin (TPO) Roofing” and Section 07 42 93 “Soffit Panels”.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and set quality standards for fabrication and installation.
   1. Build mockup of typical roof edge as shown on Drawings.
   2. Build mockup of typical roof edge, including fascia, approximately 10 feet (3.0 m) long, including supporting construction, seams, attachments and accessories.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 07 54 23, “Thermoplastic-Polyolefin (TPO) Roofing” and Section 07 42 93 “Soffit Panels”.

B. Retain "Special Warranty on Painted Finishes" Paragraph below for factory-coated metal. Delete if metal is left uncoated or field finished. Coordinate with finishes retained in Part 2.

C. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

   1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. SPRI Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressures:

1. Design Pressure: As indicated on Drawings.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C, material surfaces.

2.2 TWO-PIECE SNAP ON ROOF-EDGE FASCIA

A. Two-piece snap on roof-edge fascia: Manufactured system consisting of snap on metal fascia cap in section lengths not exceeding 12 feet (3.6 m), concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.

1. Subject to compliance with requirements, provide products by one of the following.
   a. ATAS International, Inc.
   b. Berridge Manufacturing Company
   c. Centria Architectural Systems
   d. Metal Era, Inc.

2. Metallic-Coated Steel Sheet Coping Caps: Zinc-coated (galvanized) steel, nominal 0.028-inch (0.71-mm) thickness.

a. Surface: Smooth, flat finish.
b. Finish: Two-coat mica fluoropolymer or Three-coat metallic fluoropolymer.
c. Color: As selected by Architect from manufacturer's full range.

3. Corners: Factory mitered and mechanically clinched and sealed watertight.
4. Special Fabrications: Radiussed sections.
5. Coping-Cap Attachment Method: Snap-on or face leg hooked to continuous cleat with back leg fastener exposed, fabricated from coping-cap material.

a. Snap-on fascia Anchor Plates: Concealed, galvanized-steel sheet, 12 inches (300 mm) wide, with integral cleats.
b. Face-Leg Cleats: Concealed, continuous galvanized-steel sheet.

2.3 MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.

2.4 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Subject to compliance with requirements, provide products by one of the following.
   a. Carlisle Coatings and Waterproofing, Inc.
   b. Henry Company
   c. Owens Corning

2. Thermal Stability: ASTM D 1970/D 1970M; stable after testing at 240 deg F (116 deg C).
3. Low-Temperature Flexibility: ASTM D 1970/D 1970M; passes after testing at minus 20 deg F (29 deg C).

B. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

C. Slip Sheet: Rosin-sized building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum.

2.5 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.

B. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

C. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

E. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Coil-Coated Galvanized-Steel Sheet Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with ASTM A 755/A 755M and coating and resin manufacturers' written instructions.
    a. Two-Coat Mica Fluoropolymer: AAMA 621. Fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    b. Three-Coat Metallic Fluoropolymer: AAMA 621. Fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    c. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

1. Apply continuously under copings.
2. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.

B. Felt Underlayment: Install with adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).

C. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).

3.3 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.

5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

   1. Space movement joints at a maximum of 12 feet (3.6 m) with no joints within 18 inches (450 mm) of corners or intersections unless otherwise indicated on Drawings.
   2. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws and not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F (4 deg C).

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.4 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

   1. Interlock face and back leg drip edges of two-part snap-on fascia cap into cleated anchor plates anchored to substrate at manufacturer's required spacing that meets performance requirements.
   2. Interlock face-leg drip edge into continuous cleat anchored to substrate at manufacturer's required spacing that meets performance requirements. Anchor back leg of coping with screw fasteners and elastomeric washers at manufacturer's required spacing that meets performance requirements.

3.5 ROOF-EDGE SPECIALITIES INSTALLATION

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 71 00

SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof curbs.
2. Equipment supports.
3. Pipe supports.

B. Related Sections:

1. Section 05 50 00 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
2. Section 05 52 13 "Pipe and Tube Railings" for safety railing systems not attached to roof-hatch curbs.
3. Section 07 62 00 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
4. Section 07 71 00 "Roof Specialties" for manufactured fasciae, copings, gravel stops, gutters and downspouts, and counterflashing.
5. Section 23 05 48 "Vibration and Seismic Controls for HVAC" for special curbs designed to accommodate seismic and vibration controls.
6. Section 23 34 23 "HVAC Power Ventilators" for power roof-mounted ventilators.
7. Section 23 74 13 "Packaged, Outdoor, Central-Station Air-Handling Units" for standard curbs specified with rooftop units.

1.3 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

D. Delegated-Design Submittal: For roof curbs and equipment supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

B. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design roof curbs and equipment supports to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind-Restraint Performance: As indicated on Drawings.

2.2 ROOF CURBS

A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, straight sides and integrally formed deck-mounting flange at perimeter bottom.

1. Subject to compliance with requirements, provide products by one of the following.
a. AES Industries, Inc.
b. Curbs Plus, Inc.
c. Thybar Corporation

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Supported Load Capacity: Coordinate with mechanical equipment loads proposed, submitted and approved..

D. Material: Zinc-coated (galvanized) steel sheet, 0.064 inch (1.63 mm)thick.

1. Finish: Two-coat fluoropolymer.
2. Color: As selected by Architect from manufacturer's full range.

E. Construction:

1. Curb Profile: Manufacturer's standard compatible with roofing system.
2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
3. Fabricate curbs to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.
4. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange.
5. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
6. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
7. Liner: Same material as curb, of manufacturer's standard thickness and finish.
8. Nailer: Factory-installed wood nailer along top flange of curb, continuous around curb perimeter.
9. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to meet wind uplift requirements.
10. Platform Cap: Where portion of roof curb is not covered by equipment, provide weathertight platform cap formed from 3/4-inch (19-mm) thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
11. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.
12. Damper Tray: Provide damper tray or shelf with opening 3 inches (76 mm) less than interior curb dimensions indicated.

2.3 EQUIPMENT SUPPORTS

A. Equipment Supports: Internally reinforced perimeter or Rail-type metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded corner joints and integrally formed structure-mounting flange at bottom.

1. Subject to compliance with requirements, provide products by one of the following.

a. AES Industries, Inc.
b. Curbs Plus, Inc.
c. Thybar Corporation

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Supported Load Capacity: Coordinate with mechanical equipment loads proposed, submitted and approved.

D. Material: Zinc-coated (galvanized) steel sheet, 0.064 inch (1.63 mm) thick.

1. Finish: Two-coat fluoropolymer.
2. Color: As selected by Architect from manufacturer's full range.

E. Construction:

1. Curb Profile: Manufacturer's standard compatible with roofing system.
2. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
3. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
4. Nailer: Factory-installed continuous wood nailers 3-1/2 inches (90 mm) wide on top flange of equipment supports or under top flange on side of curb, continuous around support perimeter.
5. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb of size and spacing required to meet wind uplift requirements.
6. Platform Cap: Where portion of equipment support is not covered by equipment, provide weathertight platform cap formed from 3/4-inch (19-mm) thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
7. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
8. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
9. Fabricate equipment supports to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.
10. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.

2.4 PIPE AND DUCT SUPPORTS

A. Fixed-Height Cradle-Type Pipe Supports: Polycarbonate pipe stand accommodating up to 3 inch- (80-mm-) diameter pipe or conduit; with provision for pipe retainer and with manufacturer's support pad or deck plate as recommended for penetration-free installation over roof membrane type; as required for quantity of pipe runs and sizes.

2.5 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.
   1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

      a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
   2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 (AZM150) coated.
   1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

      a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
   2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

C. Aluminum Sheet: ASTM B 209 (ASTM B 209M), manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
   1. Exposed Coil-Coated Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

      a. Two-Coat Fluoropolymer Finish: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
   2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

D. Aluminum Extrusions and Tubes: ASTM B 221 (ASTM B 221M), manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.

E. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

F. Steel Tube: ASTM A 500/A 500M, round tube.

G. Galvanized-Steel Tube: ASTM A 500/A 500M, round tube, hot-dip galvanized according to ASTM A 123/A 123M.

H. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.6 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 1, thickness as indicated.

C. Glass-Fiber Board Insulation: ASTM C 726, nominal density of 3 lb/cu. ft. (48 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C), thickness as indicated.

D. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.

E. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

G. Underlayment:

1. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
2. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
3. Slip Sheet: Building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum, rosin sized.
4. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
5. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
6. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
7. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
8. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

H. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

I. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

J. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

K. Asphalt Roofing Cement: ASTM D 4586/D 4586M, asbestos free, of consistency required for application.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum and stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof Curb Installation: Install each roof curb so top surface is level.

D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.

E. Roof-Hatch Installation:

1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
2. Attach safety railing system to roof-hatch curb.
3. Attach ladder-assist post according to manufacturer's written instructions.

F. Pipe Support Installation: Comply with MSS SP-58 and MSS SP-89. Install supports and attachments as required to properly support piping. Arrange for grouping of parallel runs of horizontal piping, and support together.

1. Pipes of Various Sizes: Space supports for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

G. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 72 00

SECTION 077253 - SNOW GUARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rail-type, seam-mounted snow guards.

1.3 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for snow guards.

B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.

1. Include details of rail-type snow guards.
2. Include calculation of number and location of snow guards based on snow load, roof slope, roof type, components, spacings, and finish.

C. Samples: Base, bracket, and 12-inch-(300-mm-)long rail.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Structural Performance:

1. Snow Loads: As indicated on Drawings.

2.2 RAIL-TYPE SNOW GUARDS

A. Seam-Mounted, Rail-Type Snow Guards:

a. Alpine SnowGuards, a division of Vermont Slate & Copper Services, Inc.
b. LMCurbs.
c. S-5! Attachment Solutions; Metal Roof Innovations, Ltd.
d. Sno-Gem, Inc; Sno-Barricade.
e. Snow Management Systems.

2. Description: Snow guard rails fabricated from metal pipes, bars, or extrusions, anchored to brackets and equipped with two rails.
3. Material and Finish: Stainless steel; mill.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.

1. Verify compatibility with and suitability of substrates including compatibility with existing finishes or primers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare substrates for bonding snow guards.

B. Prime substrates according to snow guard manufacturer's written instructions.

3.3 INSTALLATION

A. Install snow guards according to manufacturer's written instructions.

B. Attachment for Standing-Seam Metal Roofing:

1. Do not use fasteners that will penetrate metal roofing, or fastening methods that void metal roofing finish warranty.
2. Seam-Mounted, Rail-Type Snow Guards: Stainless-steel clamps attached to vertical ribs of standing-seam metal roof panels.

END OF SECTION 077253

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Non-staining silicone joint sealants.
   2. Urethane joint sealants.
   3. Butyl joint sealants.
   4. Latex joint sealants.

B. Related Requirements:

   1. Section 079100 "Preformed Joint Seals" for preformed compressible foam and precured joint seals.
   2. Section 079219 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.
   3. Section 321373 "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

   1. Joint-sealant application, joint location, and designation.

2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.

C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

1. Joint-sealant location and designation.
2. Manufacturer and product name.
3. Type of substrate material.
4. Proposed test.
5. Number of samples required.

D. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

E. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

F. Field-Adhesion-Test Reports: For each sealant application tested.

G. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with stone substrates.
4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.8 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.9 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two (2) years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 NONSTAINING SILICONE JOINT SEALANTS

A. Non-staining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. Silicone, Non-staining, S, NS, 100/50, NT: Non-staining, single-component, non-sag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Pecora Corporation
2. Sika Corporation; Joint Sealants
3. Tremco Incorporated

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, non-sag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Pecora Corporation
2. Sika Corporation; Joint Sealants
3. Tremco Incorporated

B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.

1. BASF Corporation; Construction Systems
2. Pecora Corporation
3. The Sherwin-Williams Company

2.4 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.

1. Bostik, Inc.
2. Pecora Corporation
3. Tremco Incorporated

2.5 LATEX JOINT SEALANTS

A. Acrylic Latex: Siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Pecora Corporation
2. The Sherwin-Williams Company
3. Tremco Incorporated

2.6 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Non-staining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

1. Alcot plastics Ltd.
2. BASF Corporation; Construction Systems
3. Construction Foam Products; a division of Nomaco, Inc.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials, or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean, porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Limestone
    d. Granite

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Plastic.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed, and cured sealant joints as follows:

   a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
   b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces JS-#1.

1. Joint Locations:

    a. Control and expansion joints in brick pavers.
    b. Isolation and contraction joints in cast-in-place concrete slabs.

c. Joints between different materials listed above.
d. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, P, 25, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces JS-#2.

1. Joint Locations:

a. Construction joints in cast-in-place concrete.
b. Control and expansion joints in unit masonry.
c. Joints in dimension stone cladding.
d. Joints between metal panels.
e. Joints between different materials listed above.
f. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
g. Control and expansion joints in ceilings and other overhead surfaces.
h. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, non-staining, S, NS, 100/50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces JS-#3.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, P, 25, T, NT.
3. Joint-Sealant Color: Match, as selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces JS-#4.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Vertical joints on exposed surfaces of unit masonry, concrete walls and partitions.
c. Joints on underside of plant-precast structural concrete planks.
d. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement JS-#5.

1. Joint Locations:

   a. Control joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
   c. Other joints as indicated on Drawings.

2. Joint Sealant: Siliconized acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Concealed mastics JS-#6.

1. Joint Locations:

   a. Aluminum thresholds.
   b. Sill plates.
   c. Other joints as indicated on Drawings.

2. Joint Sealant: Butyl-rubber based.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 92 00

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
3. Division 08 Section “Flush Wood Doors”.
4. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
5. Division 08 Section "Door Hardware".
6. Division 08 Section "Access Control Hardware".
7. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
8. Division 26 "Electrical" Sections for electrical connections including conduit and wiring for door controls and operators installed on frames with factory installed electrical knock out boxes.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.

6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Doors Under Specified Pressure Differences Across the Specimens.
11. ASTM E1332 - Standard Classification for Determination of Outdoor-Indoor Transmission Class.
12. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
13. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
14. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
15. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
16. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
17. NFRC 102 – Procedure for Measuring the Steady State Thermal Transmittance of Fenestration Systems.
18. NFRC 400 – Procedure for Determining Fenestration Product Air Leakage.
19. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
20. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.6 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).
3. Steelcraft (S).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.

1. Design: Flush panel.
2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 “Laminated Core”.

a. Provide 22-gauge steel stiffeners at 6 inches on-center internally welded at 5" on- center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
b. Thermal properties to rate at a fully operable minimum U-Factor 0.37 and R-Value 2.7, including insulated door, thermal-break frame and threshold.
c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.38 and R-Value 2.6, including insulated door, kerf type frame, and threshold.

3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053 inch - 1.3-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard vertical steel-stiffener core. Minimum 22 gauge steel-stiffeners at 6 inches on-center construction attached by spot welds spaced not more than 5" on centers. Spaces between stiffeners filled with fiberglass insulation (minimum density 0.8#/cubic ft.).

a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. CECO Door Products (C) Honeycomb Core - Regent Series.
2. Curries Company (CU) - QMax Core - 707 Series.

3. Curries Company (CU) - Steel-Stiffened - 747 Series.
4. Curries Company (CU) - Energy Efficient - 777 Trio-E Series.

2.4 SPECIAL FUNCTION HOLLOW METAL DOORS

A. Bullet Resistant Door Assemblies: Subject to the same compliance standards and requirements as standard hollow metal doors, provide manufacturer's custom bullet resistant internal door construction tested in accordance with U.L. Test Standard 752. Fabricate with concealed armor plate construction, 1-3/4" thickness, in the steel gauge required to meet indicated ballistic rating. Furnish as a complete unit with factory welded frame and approved listed hardware.

1. Provide bullet resistant assemblies with UL752 Level Rating of 1 through 10 as indicated.

2. Manufacturers Basis of Design:
   a. Curries Company (CU) - 737 Series.

B. Embossed Wood Grain Doors: Subject to the same compliance standards and requirements as standard hollow metal doors, provide wood pattern engraved and stainable full flush or 6-panel embossed face sheets fabricated from minimum A40 galvannealed steel with vertical edges having a similar engraved wood grain stainable surface. Door faces and edges to be factory stained and protected with a ultra-violet (UV) resistant clear coating.

1. Provide doors with a minimum .005" wood grain embossing. The wood grain pattern is to match the grain pattern design of a typical wood stile and rail door.

2. Vision lites to match engraved wood grain design and stain of the door.

3. Manufacturers Basis of Design:

   a. Curries Company (CU) - CurriStain Series.

2.5 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16” positive thermal break and integral vinyl weatherstripping.

C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.

3. Manufacturers Basis of Design:

    a. Curries Company (CU) – Thermal Break TQ Series.

D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:

    a. Curries Company (CU) - CM Series.
    b. Curries Company (CU) - M Series.

E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.6 SPECIAL FUNCTION HOLLOW METAL FRAMES

A. Bullet Resistant Frame Assemblies: Subject to the same compliance standards and requirements as standard hollow metal frames, provide where indicated manufacturer tested bullet resistance frame as part of a complete door and frame system. Fabricate bullet resistance frames from minimum 12 gauge steel with fully welded construction.

1. Manufacturers Basis of Design:

    a. Curries Company (CU) - 737 Series Frames.

2.7 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.9 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.10 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
5. Electrical Raceways: Provide hollow metal doors to receive electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware". Wire nut connections are not acceptable.

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; including but not limited to, electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".

    a. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockouts.
    b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.

c. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section "Door Hardware".
d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.

9. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
10. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
11. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
12. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.11 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 081113

SECTION 08 14 16 – Flush Wood Doors

1. GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. General Contractor provide flush wood doors as shown and herein specified

a. Install New:

1) Solid-core doors with MDO faces.
2) Shop priming of flush wood doors.
3) Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 088000 "Glazing" for glass view panels in flush wood doors.
2. Section 099123 "Painting and Coating"

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Doors finish requirements.
6. Fire-protection ratings for fire-rated doors.

C. Samples for Verification:

1. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edges representing actual materials to be used.
2. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.8 WARRANTY

A. A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
    b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

3. Warranty Period for Solid-Core Interior Doors: 5 years.

2. PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Algoma Hardwoods, Inc.
2. Ampco.
3. Chappell Door Co.
4. Eggers Industries.
5. General Veneer Manufacturing Co.
6. Graham Wood Doors; an Assa Abloy Group company.
7. Haley Brothers, Inc.
8. Ipik Door Company.
9. Lambton Doors.
10. Marlite.
11. Marshfield Door Systems, Inc.
12. Mohawk Doors; a Masonite company.
13. Oshkosh Door Company.
14. Poncraft Door Company.
15. Vancouver Door Company.
16. VT Industries, Inc.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.

B. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

D. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
1. Temperature-Rise Limit: At vertical exit enclosures provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

2. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.

E. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-1 or Grade LD-2, made with binder containing no urea-formaldehyde.
2. Particleboard: Straw-based particleboard complying with ANSI A208.1, Grade LD-2 or M-2, except for density.
3. Blocking: Provide wood blocking in particleboard-core doors as follows:

    a. 5-inch top-rail blocking, in doors indicated to have closers.
    b. 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
    c. 5-inch midrail blocking, in doors indicated to have exit devices.

4. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

F. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

    a. Screw Withdrawal, Face: 700 lbf
    b. Screw Withdrawal, Edge: 400 lbf.

G. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:

    a. 5-inch top-rail blocking.
    b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
    c. 5-inch midrail blocking, in doors indicated to have armor plates.
    d. 5-inch midrail blocking, in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

    a. Screw-Holding Capability: 550 lbf per WDMA T.M.-10.

2.3 DOORS FOR OPAQUE FINISH

A. Interior Solid-Core Doors:

1. Grade: Custom.
2. Faces: MDO.

    a. Apply MDO directly to high-density hardboard crossbands.

3. Exposed Vertical and Top Edges: Any closed-grain hardwood.
4. Core: Particleboard or Structural composite lumber.
5. Construction: Three plies, either bonded or nonbonded.
6. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.4 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Any closed-grain hardwood.
2. Profile: Flush rectangular beads.

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

2.6 SHOP PRIMING

A. Doors for Opaque Finish: Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in "Section 09 91 23" Interior Painting."

3. EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 08 71 00 "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Install fire-rated doors according to NFPA 80.
2. Install smoke- and draft-control doors according to NFPA 105.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.

a. Comply with NFPA 80 for fire-rated doors.
b. 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

2. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes access doors and frames for walls and ceilings.

B. Related Requirements:

1. Section 07 72 00 "Roof Accessories" for roof hatches.
2. Section 23 33 00 "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches (150 by 150 mm) in size.

C. Product Schedule: For access doors and frames.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

A. Flush Access Doors with Exposed Flanges:

1. Subject to compliance with requirements, provide products by one of the following.
   a. Acudor Products, Inc.
   b. Babcock Davis
   c. Larsens Manufacturing

2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
3. Locations: Wall and ceiling.
4. Door Size: 24 x 24 inches (600 by 600mm).
5. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage, factory primed.
6. Frame Material: Same material, thickness, and finish as door.
7. Latch and Lock: Cam latch, hex-head wrench operated.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Frame Anchors: Same material as door face.

D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded-metal lath and exposed casing bead welded to perimeter of frames.

D. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 08 31 13

SECTION 08 31 13.53 - SECURITY ACCESS DOORS AND

FRAMES PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Security access doors and frames for walls and ceilings.

B. Related Requirements:

1. Section 083113 "Access Doors and Frames" for access doors and frames for nonsecurity applications.
2. Section 233300 "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.3 ALLOWANCES

A. Security access doors and frames are part of a security access door and frame allowance.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details materials, individual components and profiles, and finishes.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Detail fabrication and installation of access doors and frames for each type of substrate.

PART 2 - PRODUCTS

2.1 SECURITY ACCESS DOORS AND FRAMES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or a comparable product by one of the following:

1. Acudor Products, Inc.
2. Babcock-Davis.
3. Broan-Nutone LLC.
4. Cendrex Inc; MDS - Medium Security Access Door.
5. Elmdor/Stoneman Manufacturing Company; a division of Acorn Engineering Company.
6. JL Industries, Inc.; a division of the Activar Construction Products Group.
7. Karp Associates, Inc.
8. Larsens Manufacturing Company.
9. Maxam Metal Products Limited.
10. Metropolitan Door Industries Corp.
11. MIFAB, Inc.
12. Nystrom, Inc.
13. Williams Bros. Corporation of America (The).

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Medium-Security Flush Access Doors with Exposed Flanges.:

1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
2. Locations: Wall.
3. Door Size: 12" x 12".
4. Uncoated Steel Sheet for Door: Nominal 0.105 inch (2.66 mm), 12 gage.

    a. Finish: Factory prime.

5. Frame Material: Same material, thickness, and finish as door.
6. Hinges: Manufacturer's standard security hinge.
7. Hardware: Tamper-resistant lock.

D. Hardware:

1. Lock: Cylinder.
2. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Frame Anchors: Same type as door face.

D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
3. Provide mounting holes in frames for attachment of units to metal or wood framing.
4. Provide mounting holes in frame for attachment of masonry anchors.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder lock, furnish two keys per lock and key all locks alike.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:

1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
2. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13.53

SECTION 08 34 20 – POWER FOUR-FOLD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Four-Fold metal doors with surface mounted metal frames. Doors are available for 14’-0” wide x 14’-0” tall openings.

B. Operation of Four-Fold metal doors includes overhead mounted electro- mechanical operator.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product Data for each type of product specified consisting of manufacturer’s technical Product Data and installation instructions for each type of door required, including data substantiating that products comply with requirements.

C. Submittal Drawings showing fabrication and installation of Four-Fold metal doors including plans, elevations, sections, details of components, hardware, operating mechanism, and attachments to the other units of Work. Include wiring diagrams for coordination with electrical trade.

D. Reference list including (5) successful installations of this type of door within the past two (2) years.

1.4 QUALITY ASSURANCE

A. Doors shall be designed to withstand external or internal horizontal wind loads of up to 130mph (3 second gust) per ASCE 7-16 or up to 25psf (Allowable Stress Design) and 40psf (Load and Resistance Factor Design). The maximum allowable deflection shall not exceed 1/80 of the span. Fiber stresses in main members shall be limited to 27,000 pounds per square inch. Steel frames shall be designed in accordance with the AISC “Steel Construction Manual”.

B. Door manufacturer shall have at least 10-years experience in manufacturing four- fold door systems.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store delivered materials and equipment in dry locations with adequate ventilation, free from dust and water, and to permit access for inspection and handling.

B. Handle materials carefully to prevent damage.

1.6 WARRANTY

A. The door manufacturer shall provide a written standard limited warranty for material and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. Subject to compliance with the specified requirements.

2. Door Engineering and Manufacturing, FF30-Performance Series
   a. 101 Power Dr, Mankato, MN 56001
   b. Phone: (800) 959-1352

2. JUS Doors, Inc., SWIFT 2.0 Electrically Operated
   a. 3714 Alliance Dr, Ste. 305, PO Box 16639, Greensboro, NC 27416
   b. Phone: (888) 510-5331

3. Electric Power Door, Power Operated Fire Station Doors
   a. 522 West 27th Street, Hibbing, MN 55746
   b. Phone: (800) 346-5760

4. Substitutions allowed in accordance with Division 00 and 01 specifications.

2.2 MATERIALS

A. Steel Tube: ASTM A513 and ASTM A500/A500M

B. Steel Sheets: Galvannealed sheets of commercial quality, complying with ASTM A653.

C. Steel Sheets: Aluminum-Zinc Alloy-Coated sheets (Galvalume), complying with ASTM A792.

D. Steel Sheets: Steel sheets of commercial quality, complying with ASTM A1011/A1011M hot-rolled steel sheet.

E. Hardware: Manufacturer's standard components.

F. Fasteners: Zinc-coated steel.

2.3 FOUR-FOLD DOORS

A. Construction: Door framing shall be minimum 14-gauge structural steel tube with 18-gauge galvannealed steel sheet on the exterior and stucco embossed galvalume sheeting on interior faces. Sheeting shall be formed on the vertical edges with no visible welds on the interior or exterior panel faces. All frames and framing members shall be true to dimension and square in all directions, and no door shall be bowed, warped, or out of line, in the vertical or horizontal plane of the door opening by more than 1/8 inch in 20 feet. Exposed welds and welds which interfere with the installation of various parts shall be ground smooth and flush.

B. Surface Mounted Frame: Supply angle frame system constructed of minimum L6x4x3/8", designed to anchor to masonry wall construction or fasten/weld to steel structure.

C. Door Finishes shall be as follows:

1. Exterior sheeting: Manufacturer's standard epoxy primer and polyurethane finish. As selected by Architect from the full line of standard RAL colors.
2. Interior sheeting: Manufacturer's standard epoxy primer and polyurethane finish. As selected by Architect from the full line of standard RAL colors.
3. Operator and operating hardware: Powder-coated manufacturer's standard gray.
4. Tracks: galvanized
5. Surface mounted frames: Manufacturer's standard epoxy primer and polyurethane finish. As selected by Architect from the full line of standard RAL colors.
6. Fasteners: Zinc

D. Hardware: Hardware shall include guide tracks and brackets, trolleys, center guides, and all bolts, nuts, fasteners, etc. necessary for complete installation and operation.

1. All hardware, including hinges and trolleys, shall be bolted to the panel for easy removal for service or panel replacement.

2. Top tracks shall be adjustable on the end track hangers to allow

for adjustment of the door panels in the open position and easily replaceable without removal of the door framing or operators.

E. Hinges: Jamb hinges shall be dual shear and have two thrust bearings and two needle bearings. Fold hinges shall be stainless steel and be dual shear with two thrust bearings. All bearings shall be completely concealed within the hinge barrel and include grease zerks. All hinge pins shall be minimum 3/4” diameter hardened steel.

F. Weatherstripping: Material shall be adjustable and readily replaceable and provide a substantially weather-tight installation. Weatherstripping at center shall be 1/16” cloth inserted neoprene and include no exposed fasteners on the exterior face of the panel. Weatherstripping at sill shall include two 1/16” cloth inserted neoprene sweeps with an aluminum retainer. Jambs, Head, and fold seals shall be EPDM rubber.

G. Pinch Points: Provide minimum 3/4” gaps at jambs and fold to conform with UL325 pinch point requirements.

2.4 OPERATOR

A. Each Four-Fold door shall be operated by an overhead mounted electro-mechanical drive unit designed for high cycle operation. Operator consists of an electric motor, gear reducer, and rotating drive arm. The door shall be operated with connecting rods attached to the rotating drive arm on the operator and to control arms attached to the jamb door section and to the door lintel. The connecting rods shall be positive drive, keeping the door under firm control at all times. The connecting rods shall be fitted with spherical bearings and control arms shall be equipped with oil impregnated bronze bearings on polished shafts.

B. Operator shall be instantly reversible, open, and close rapidly and start and stop gradually. Operator shall be adjustable to allow door to fully clear the opening. Operator shall automatically lock the door in the closed position. Operator shall be equipped with disengaging mechanism to convert to manual operation.

C. Operator shall include adjustable torque sensing to reverse the door upon resistance from an obstruction.

D. Electric motor shall be of sufficient size to operate doors under normal operating conditions at no more than 75 percent of rated capacity. The motor shall be wound for three phase 208 VAC, 60 Hertz operation.

E. Electric Controls: Controls shall be furnished by the door manufacturer and shall be complete for each door and built-in accordance with the latest NEMA standards. Incoming electrical shall be 208/230VAC 3-phase.

1. Control panel assemblies shall be UL listed as per NFPA70.

2. Controls shall include a programmable logic controller with digital message display mounted on panel door. Controller shall include programmable close timers and programmable inputs/outputs.

3. Controls shall include a variable frequency drive with independent adjustment of the opening and closing speeds.

4. Enclosures shall be NEMA 4 with disconnect switch.

5. Pushbuttons (interior) for each door shall have one (1) momentary pressure three-button push-button station marked “OPEN”, “CLOSE” and “STOP”. Push button enclosure shall be NEMA 4.

6. Limit switches shall be provided to stop the travel of the door in its fully open or fully closed position.

7. Safety edges: Provide monitored electric safety edges on leading edge of all doors to reverse door upon contact with obstruction.

8. Photo eyes: Provide (1) exterior, jamb mounted, light Curtain type photo eyes, NEMA 4 rated. Photo eye shall cover from floor level to 72” above floor.

9. Presence Sensor: Provide (1) interior, overhead mounted, presence sensor BEA IS40P or equal.

10. Radio controls: Provide one (1) radio receiver and two (2) single button remotes per door. Remotes to open and close doors with single button.

11. Timer Activation Loop Detectors: (Option) Provide “pulse on exit type” loop detector to activate auto close timer once loop has been activated and cleared, include hand/auto switch to deactivate timer. G.C. to coordinate installation of preformed loop with installer prior to pouring the concrete.

12. Warning Horn/Strobe: Provide warning light and strobe. Include outputs PLC to allow for activation while door is in motion both opening and closing, along with activation prior to closing. Include programmable “delay-to-close” timer which activates the warning horn for a set time, prior to the door closing.

13. Wiring: Door manufacturer shall supply controls and components only. Electrical contractor shall install controls and furnish and install conduits and wiring for jobsite power and control wiring.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install Four-Fold metal doors in strict accordance with the approved drawings by qualified door erection crews. All door openings shall be completely prepared by the general contractor prior to the installation of the doors. Permanent or temporary electric wiring shall be brought to the door opening before installation is started and shall be completed so as not to delay the inspection test.

B. Doors shall be set plumb, level, and square, and with all parts properly fastened and mounted. All moving parts shall be tested and adjusted and left in good operating condition.

3.2 ADJUSTING AND CLEANING

A. Inspection of the doors and a complete operating test will be made by the installer in the presence of the general contractor or architect as soon as the erection is complete. Any defects noted shall be corrected. After door approval in the above test, the general contractor must assume the responsibility for any damage or rough handling of the doors during construction until the building is turned over to the owner and final inspection is made.

B. Clean surfaces and repaint abraded or damaged finished surfaces to match factory-applied finish.

END OF SECTION 08 34 20

SECTION 08 34 63 - DETENTION DOORS & FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes security hollow metal doors and frames with related accessories.

B. Related sections:

1. Security Glazing
2. Security Hardware
3. Painting
4. Detention Equipment General
5. Security Electronics

1.2 REFERENCES

A. Standards of the following as referenced herein:

1. American National Standards Institute (ANSI).
2. American Society for Testing and Materials (ASTM).
3. American Welding Society (AWS).
4. Code of Federal Regulations (CFR).
5. Hollow Metal Manufacturers Association (HMMA).
6. National Association of Architectural Metal Manufacturers (NAAMM)
7. National Fire Protection Association (NFPA).
8. Underwriters Laboratories, Inc. (UL).
9. ANSI/NAAMM/HMMA 863 -14 Guide Specifications for Detention Security Hollow MetalDoors and Frames.

1.3 SUBMITTALS

A. Product data: Submit manufacturer's product literature and technical data indicating compliance with specified requirements and performance criteria. Include material and fabrication specifications, installation instructions and manufacturer’s recommendations for storage, handling and protection of products.

B. Shop drawings: Submit schedules and drawings showing elevations, sections and details of security hollowdoors and frames.

1. Indicate sizes, architect design, metal gauges and type, door swings, anchorage and fasteningmethods, reinforcement and fire rating requirements.

2. Include dimensioned locations of hardware and preparation requirements, grout and access holelocations when required, and details of openings.

3. Use same reference numbers indicated on contract drawings in preparing schedules.

C. Welder certification: Submit welder's certification for Architect's information only in compliance with specified qualification requirements.

D. Test Reports: Submit for Architect's information only.

1. Submit certified reports by an independent testing laboratory current within the past two years indicating that manufacturer's security hollow metal doors and frames proposed for use has been tested in compliance with specified ANSI/NAAMM/HMMA 863-14 standard and ASTM F1450-12a.

a. Tests shall have been made from fabrications of identical construction proposed for installation on the Project complying with requirements of specified standard. Test reports shall include specifications and construction details of tested assemblies and document all pass criteria as required by the specification.

b. Tests shall indicate satisfactory testing to meet structural and security performance requirements specified, as a minimum and shall have been performed no more than 2 (two)years prior to bid date.

2. If test data is not available for proposed security hollow metal work, or if data does not indicate compliance with specified requirements, Contractor shall be responsible for securing satisfactory tests by an independent testing agency acceptable to Architect prior to acceptance/approval of submittal drawings. All costs for such testing shall be borne by Contractor.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Manufacturer shall have been regularly engaged in the production of security hollow metal fabrications of similar design and construction as specified for this Project with minimum five (5) years' experience.

2. If requested by architect, submit satisfactory evidence of at least three (3) projects of similar sizeand complexity completed within the past three (3) years. Include names and locations of pro- jects, references, and owner contacts with phone numbers, manufacturer's qualification statement.

B. Welder Qualifications:

1. Welders employed for this project shall be qualified in accordance with 4.6 of ANSI/AWS D1.3 test procedures for welding work required and shall have passed qualification tests.

C. Regulatory Requirements: Doors, including locations of related hardware, required to be accessible to thephysically disabled shall comply with the Americans with Disabilities Act (ADA), 28-CFR Part 36, Appendix A, "Accessibility Guidelines for Buildings and Facilities."

D. Single source requirements: Security hollow metal doors and frames installed throughout Project shall beby a single manufacturer.

E. Fire-rated door assemblies: Fire-rated door and frame assemblies shall be of design and construction identical to assemblies tested in accordance with ASTM 152, NFPA 252-2008 or UL 10B and comply with requirements of NFPA 80-1995. Assemblies shall be Classified or Listed by Underwriters Laboratories (UL) or Warnock Hersey, Inc. (WHI), or Approved by Factory Mutual (FM). Furnish fire-rated door and frame assemblies bearing factory applied labels of Testing and Inspection Agency indicating classification rating.

F. Pre-installation conference: Contractor shall schedule and convene meeting (in person or via conference call) during submittal review period and prior to installation of specified materials to review and coordinatework to be accomplished.

1. Contractor, Architect security hollow metal fabricator, security hardware supplier, electronic security systems subcontractor and other trades affected by work shall be present.
2. Contractor shall notify applicable parties at least fourteen (14) days prior to time of meeting.
3. Contractor shall record minutes of meeting and distribute copies to all parties in attendance.

1.5 DESIGN AND PERFORMANCE REQUIREMENTS

A. Security Hollow Metal Doors and Frames: Comply with ANSI/NAAMM HMMA 863-14, "Guide Specifications for Detention Security Hollow Metal Doors and Frames", except where more stringent requirementsare specified and agreed to herein.

B. Welding: Comply with applicable AWS standards specified as follows for welding work required.

1. 4.6 of ANSI/AWS D1.3

C. Performance and Testing: All security hollow metal doors and frames shall comply with performance requirements specified in referenced HMMA 863-14 standard and meeting minimum Security Grade No.1in accordance with ASTM F1450-12a.

1. The following test procedures shall be performed as described in ANSI/NAAMM/HMMA standard:
   a. Door Static Load Test.
   b. Door Rack Test.
   c. Door Edge Crush Test.
   d. Removable Glazing Stop Test.
2. An independent testing laboratory retained by the manufacturer certifying compliance with specified requirements shall perform testing.

1.6 DELIVERY, STORAGE AND HANDLING:

A. Deliver security hollow metal work to job site packaged for protection. Contractor should comply with ANSI/NAAMM/HMMA 863-14 Guide Specifications for Installation and Storage of Hollow Metal Doorsand Frames, and as noted herein.

B. Remove coverings, wrappings or cartons and inspect materials for damage upon delivery.

1. Reject damaged materials which cannot be repaired and remove from site.
2. Clean and touch-up scratches, abrasions, and minor damages to pre-finished metal surfaces withmatching coating material applied in shop.
3. Store materials in vertical position on raised platform, minimum 4" off of floor and under cover with pro-visions for adequate air circulation.
4. Provide wood spacer between units to permit circulation.
5. Protect stored materials from moisture. Do not use non-vented plastic or canvas shelters that cancreate a humidity chamber for covering materials.

C. Materials not properly stored and protected, which results in rusting or damages shall not be permitted forinstallation and removed from the site. Replace damaged or rusted materials at no additional cost to Owneror Manufacturer.

1.7 COORDINATION, SEQUENCING AND SCHEDULING

A. Schedule and sequence installation with work specified in other sections. Coordinate security hollow metalfabrication with security hardware, security glazing and electronic security system work.

B. Coordinate fabrication of security hollow metal frames with wall construction in which it is to be installed.Coordinate installation of anchors and items required to be built into other work.

C. Coordinate location and installation of hardware specified in Security Hardware section.

1. Obtain hardware manufacturer's templates for prepping doors and frames.
2. Verify frame depths and widths to ensure fitting of jamb-mounted locks, security electronics de-vices and other specified hardware scheduled to be mounted in frames.

D. Coordinate depths and locations of removable glazing stops to accommodate specified glazing materials and glazing methods to maintain required clearances and bite or engagement dimension.

E. Coordinate locations of conduits, junction boxes and similar items required to be installed in security hollow metal work to facilitate electrical and electronic security systems for interconnecting electric operated hardware, monitoring devices, intercommunication systems and other components scheduled in security hardware section.

F. Coordinate door sizes and sill clearance with finish flooring and threshold materials to allow for proper fitting into framed openings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers, subject to compliance with specified requirements:

1. Titan Steel Door, LLC
2. Trussbilt, LLC

2.2 MATERIALS AND FINISHES:

A. Steel: Complying with specified HMMA 863 standard. Material shall be free of scale, pitting, coil breaks, buckles, waves surface blemishes or any other defects caused by the use of improper leveled sheets.

1. Interior doors and frames: Commercial quality, leveled cold-rolled carbon steel sheet meeting ASTM A 1008 or hot-rolled, pickled, and oiled carbon steel sheet meeting ASTM A 1011.
2. Exterior doors and frames: Electro-Galvannealed, steel sheet meeting ASTM A653/A653CS Type B, Commercial Steel (CS classification), Coating Designation A60.

B. Primer Finish: Complying with requirements specified in referenced HMMA 863 standard and as follows.

1. Interior doors and frames: Minimum one coat of manufacturer's standard rust-inhibitive primer on steel surfaces unless otherwise specified.
2. Exterior doors and frames: Minimum one coat of manufacturer's standard rust-inhibitive primer on steel surfaces unless otherwise specified.

C. Glazing materials: As specified in Security Glazing section.

2.3 DOORS

A. Door Design and Sizes: As indicated on drawings.

B. Door Thickness: 2-inches

C. Door Construction: Comply with referenced HMMA 863 standard, except where more stringent requirements are specified.

1. Door face:
   a. Interior doors: Fabricated from minimum 12 gauge (0.100-inch thickness minimum) specified steel sheet material.
   b. Exterior doors: Fabricated from minimum 12 gauge, (0.100-inch thickness minimum) specified steel sheet material, specified galvannealed steel sheet material shall have a zinc coating applied by the electro process conforming to ASTM A 653/A 653CS (A60).

2. Internal Stiffeners: Internal stiffener construction shall extend full height of door, top to bottom at specified spacing's beginning not more than 4-1/2-inches from door vertical edges.

    a. Continuous interlocking reinforcement stud formed from steel sections sized to span full door thickness between face sheets. Studs shall be fabricated from CRCQ steel material same as specified for doors and frames, minimum 18 gauge (0.0516-inch thickness) with vertical interior webs spaced not more than 4-inches apart and spot welded at 3-inches vertical centers, maximum, secure to both face sheets. Studs to be interlocked together 3" from each end of door.

3. Vertical Edges: Reinforced by minimum 12 gauge (0.100-inch thickness) continuous steel channel, extending full length of door and spot welded to front face sheets at 3-inches on center and welded to inner channel to make a four intersection points producing a welded interior section.

4. Top and Bottom Inner channel: Provide minimum 12 gauge (0.100-inch thickness), channel at top and bottom of the door. Top and bottom inner channels shall be welded to interlocking studs at each intersecting point.

5. Top and Bottom Outer Channels: Provide minimum 12-gauge (0.100-inch thickness) channel fitted to top and bottom of the door. Outer channels shall be continuously welded to both face sheets. The bottom outer channel should have weep holes at each end of the channel.

6. Core Insulation: Minimum 8 pcf density mineral wool batt-type insulation. Fill spaces and voids continuous between stud construction with specified insulation material.

7. Edge Profiles: Vertical edges beveled 2 degrees.

D. Fire-Rated Doors: Fabricated from specified steel material, gauge and construction, except complying with fire test requirements bearing labels of Testing and Inspection Agency for ratings indicated. Doors shall be constructed with core materials required to achieve specified fire test labeling.

2.4 FRAMES

A. Types, Sizes and Profiles: As indicated on drawings.

B. Frame Construction: Complying with referenced HMMA 863-14 standard, except where more stringent requirements are specified and agreed to in writing. Frames shall be welded construction formed to profiles indicated with backbends.

1. Corner joints: Construct with faces mitered and stops either butted or mitered with contact edges closed tight and joints continuous welded. Use of gussets or splice plates shall not be permitted.

2. Integral stops: Fabricate frames for swinging doors and borrowed lite frames with integral stops as specified.

    a. Stop heights: Provide specified heights for frame types as follows, unless otherwise indicated:

        1) Frames for swinging doors: Minimum 0.075-inch (3/4") height,

unless otherwise indicated.

2) Borrowed lite frames: Minimum 1.25-inch (1-1/4") height unless otherwise indicated.

3. Mullions: Same gauge and material as specified for frames; closed fabrication conforming to profiles indicated on final reviewed and accepted shop drawings.
   a. Fabricated members shall have no visible seams or joints. Joints between stops of abutted members shall be welded along the soffit and finished to a neat and uniform appearance.
   b. Installer shall provide for welding and finishing all field joints between faces of abutted members.
4. Field splicing: Provide for field splicing of frames only when shipping limitations restrict sizes of frames for large openings which cannot be fabricated as a single unit.
   a. Install splices only at locations indicated on final reviewed and accepted shop drawings.
   b. Splice joints shall be aligned, flush, tight and finished to a neat uniform appearance.
   c. Do not torch cut frames.
5. Temporary spreaders: Furnish frames with two (2) temporary steel spreaders welded 2” from the bottom of each jamb to brace fabrication during shipping, storage and handling. Frame installer to touch-up marks on frames caused by spreader removal upon erection.

C. Fire-Rated Frames: Fabricated from specified steel material, gauge and construction, except complying with fire test requirements bearing labels of Testing and Inspection Agency for ratings indicated.

2.5 FRAME ANCHORS

A. Floor Anchors: Manufacturer's clip type fabricated with two holes for fasteners and secured to inside of each jamb with three (3) MiG welder per anchor at both sides and top.
   1. Floor anchors shall be fabricated from same steel material and gauge as specified for frames.

B. Sill Anchors: Minimum 12-gauge (0.100-inch) thickness continuous steel plate set in sealant and anchored in place with 0.375-inch (3/8") diameter by 3-inch length expansion bolts at 32-inches (2'-8") on center at borrowed lights and sidelights frames the sit on the floor.

C. Jamb Anchors:
   1. Types:
      a. Adjustable jamb anchors for installation in masonry walls: T-shaped masonry strap anchor types fabricated from same steel material and

gauge as specified for frames; corrugated or perforated and with punched hole to receive wall reinforcement bar. Straps shall be minimum 2-inch width by 10-inch length.

b. Expansion bolt anchor method for frame installation in existing or completed openings of masonry or concrete walls: Provide expansion bolt anchoring method consisting of square hole with strap anchor in frame to receive 0.5-inch (1/2") diameter bolt and a conduit spacer extending from the back of the frame soffit to the wall substrate.

1) Locate anchor hole preparation at same spacings as specified for jamb anchors. Weld spacers to frame.

2) Bolts installed to frames, after sufficient tightening to provide rigid secure attachment, shall have square plug welded to frame, ground, dressed and finished smooth.

3) Bolts used for attaching frames to wall openings shall be sleeve type expansion anchors or epoxy-set anchoring system as indicated on final reviewed shop drawings.

2. Jamb anchor spacing: Spaced at maximum 16-inches (1'-4") on center, but not less than two per jamb.

2.6 GLAZING STOPS AND MOLDINGS

A. Door Glazing Stops: Provide fixed steel moldings and removable stops for doors with glazed view openings to accommodate sizes and thickness of specified security glazing materials. Stops shall be fabricated with 1.25-inch (1-1/4") height legs to form glazing pocket.

1. Fixed moldings: Fabricated from minimum 0.100-inch (12 gauge) thickness bent steel plate and spot welded to both face sheets at maximum 3-inches on center.

2. Removable stops: Fabricated from minimum 0.123-inch (10 gauge) thickness pressed steel offset with predrilled holes to receive specified fasteners at spacings indicated.

a. Stops shall be notched with tight fitting joints at corners and welded into a one-piece unit.

b. Provide offset angle stops for openings scheduled to receive glazing materials greater than 0.5-inch (1/2") thickness. Fabricate stops with flanges overlapping opening for fastener attachment through door face.

c. Attach stops with specified fasteners spaced at maximum 6-inches on center and positioned within 3-inches of corners with Truss Head Torx T30 thread forming screws.

d. There shall be a minimum of 1” glazing engagement.

3. Finish: All surfaces of glazing stops, including metal surfaces to which glazing stops are secured to, shall be chemically treated for paint adhesion and coated with rust inhibitive primer prior to installation to doors.

B. Frame Glazing Stops: Provide removable angle stops for borrowed lite frames scheduled

to receive specified security glazing materials.

1. Removable Angle Stops: Fabricated from minimum 10-gauge (0.123-inch) thickness by 1.25-inch (1-1/4") by 1.25-inch (1-1/4") pressed steel angles with predrilled holes to receive specified fasteners at spacings indicated.
    a. Angle stops shall be mitered or notched with tight fitting joints at corners.
    b. Attach stops with specified fasteners spaced at maximum 6-inches on center and positioned within 3-inches of corners with Truss Head Torx T30 thread forming screws.
2. Finish: Frame surfaces underneath glazing stops and all surfaces of glazing stops shall be chemically treated for paint adhesion and coated with rust inhibitive primer prior to installation to frames.

C. Fasteners: Provide tamper-resistant, center pin round head, Truss head, 1/4-20, Grade No. 8, cadmium coated, security thread forming screws for attachment of glazing stops.

2.7 GROUT GUARDS AND GROUT

A. Grout Guards: Provide grout guards fabricated from minimum 16-gauge (0.054-inch thickness) steel for frames to be set in masonry or concrete openings and grouted. Plastic grout guards shall not be permitted.
1. Weld steel grout guards tight to back of frames at all hardware preparations, glazing stop screw holes and silencer preparations.
    a. Grout guards for glazing stop screws shall be factory installed and shall cover the exposed portion of the screws inside the frame throat, around the perimeter. Where mullions are required to be grouted, screws inside mullions shall be protected with specified steel grout guards.
    b. Silencer preparations shall be protected by steel grout guards where accessible from frame throat. Where limited access prevents installation for metal grout guards in mullions, silencers shall be factory furnished and installed.
2. Provide polyurethane or polystyrene foam fill at hinge preparations or otherwise seal grout guards tight to keep screw holes free of grout.

B. Grout: Conforming with ASTM C476-01 with maximum 4-inch slump consistency. Grout specified in Division 4 masonry sections of same consistency may be used subject to Architect's acceptance.

C. Grout Access Holes: Provide access holes in frames where frame throat cannot be accessed for grouting due to erection method or construction sequencing.
1. Fabricate access holes in frames with 1.25-inch (1-1/4") square cut-out reinforced with minimum 12 gauge (0.093-inch thickness) by 1.5-inch (1-1/2") square back-up plate welded to inside face of frame.
2. Fabricate back-up plate with 1.125-inch (1-1/8") diameter hole centered within square cut-out in frame when welded in place.
3. Provide steel plug to fit square cut-out in frame to close access hole after

grouting. Steel plug closure plate shall be fabricated from same material and gauge steel as frame.

2.8 HARDWARE PREPARATION

A. Mortised Hardware: Reinforce, mortise, drill, tap and prepare doors and frames for templated mortised hardware in the factory in accordance with final reviewed hardware schedule and templates furnished by hardware manufacturer.

B. Surface Applied Hardware: Where surface-mounted hardware, including anchor hinges, thrust pivots, pivot reinforced hinges or non-templated hardware, are to be installed, reinforce doors and frames as re- quired and perform drilling and taping in the field to mount specified hardware.

C. Hardware Reinforcement: Provide hardware reinforcing plates for doors and frames in steel thickness as specified below.

1. Doors:
    a. Full mortise hinges and pivots: Minimum 0.250-inch (1/4") thickness.
    b. Surface applied security hinges: Minimum 0.250-inch (1/4") thickness.
    c. Strike reinforcements: Minimum 0.177-inch (7 gauge) thickness.
    d. Reinforcement for lock fronts, concealed holders, or surface mounted closer: Minimum 12 gauge (0.093-inch thickness).
    e. Internal reinforcements for all other surface applied hardware: Minimum 12 gauge (0.093-inch thickness).
2. Frames:
    a. Hinge and pivot reinforcements: Minimum 0.250-inch (1/4") by 1.5-inch (1-1/2") width by 9-1/2-inch length. Provide additional minimum 12-gauge (0.093-inch thickness) steel angle welded to back of frame face and hinge reinforcement to resist deformation under swinging door load at all hinges.
    b. Strike reinforcement: Minimum 0.177-inch (7 gauge) thickness
    c. Closer reinforcements: Minimum 0.177-inch (7 gauge) thickness
    d. Flush bolt reinforcements: Minimum 0.177-inch (7 gauge) thickness
    e. Reinforcement for surface applied hardware: Minimum 12 gauge (0.093-inch thickness).

D. Key Cylinders: Factory prepares frames to receive key cylinder extensions as scheduled within hardware sets, if unscheduled provide key wells or hand holes for key access to lock.

E. Electric operated hardware and security system devices: Provide hardware enclosures and junction boxes interconnected with required conduits and connectors for installation of electric operated and monitored hardware, intercom systems, intercommunication devices and other specified electronic security system devices.

1. Conduits and Connectors: Provide minimum 0.75-inch (3/4") size electrical

metallic tubing (EMT) conduits with steel compression type connectors having insulated throats; UL Approved.

2. Access Covers: Provide access covers for junction boxes and at other locations required in frames to facilitate installation of wiring, electrical components and security system devices required to be incorporated into frame fabrication.

   a. Access covers shall be fabricated from same material and metal thickness as specified for frames.

   b. Fabricate cut-outs in frames prepared to receive access covers with tight accurate fitting, seated flush with adjacent surfaces.

   c. Fasten access covers in place to frames with same type and size fasteners specified for glazing stops spaced at maximum 6-inch center, but not less than four (4) per cover.

   d. Access covers shall be chemically treated for paint adhesion and finished same as frame.

   e. Coordinate access cover locations with electrical and security system work.

F. Hardware Locations: Comply with referenced HMMA 863 standard for location of hardware and as indicated below, unless superseded by specified ADA requirements.

1. Jamb-mounted locks: Locate centerline of lockbolt or latch bolt 38-inches (3'-2") up from finished floor except as specified for exit door jamb-mounted locks and auxiliary latchets.

2. Exit door jamb-mounted locks and auxiliary latch sets: Locate centerline of lockbolt or latch bolt 50-inches (4'-2") up from finished floor with auxiliary latch set lever handle or rose centerline located 32-inches (2'-8") up from finished floor.

3. Weather stripping and silencers: Comply with manufacturer's recommendations.

2.9 PASS OPENINGS

A. Food Passes:

1. Openings:

   a. Door Openings: Flush construction fabricated with minimum 12 gauge (0.093-inch thickness) interior channels framed around perimeter of cut-out; perimeter of cut-out at inmate side of food pass to be welded continuous. Corner seams shall be welded continuous and dressed smooth. Finished opening shall be constructed so as it cannot be dismantled or affected by tampering or scraping.

   b. Opening size: 5” x 15” (side cut food pass)

2. Shutters: Food Pass shutter shall be constructed from a machined 0.250-inch (1/4” thickness) plate.

   a. Construct shutter to seal opening tight when closed and to prevent tampering with lock and hinges.

B. Hardware:

1. Lock preparation: Prepare pass openings and shutters to receive lock specified in security hard-ware section.
2. Pull Handles: Provide steel handle welded to shutter, fabricated with integral keeper to acceptlock latch bolt.

C. Finish: Shutter shall be prepped for paint adhesion and finished same as specified for doors.

2.10 FABRICATION

A. Fabricate security hollow metal work in accordance with final reviewed and accepted shop drawings and complying with referenced ANSI/NAAMM HMMA 863 standard, except where more stringent requirements are specified and agreed to.

B. Form members straight and uniform in profile throughout its entire lengths. Construct work rigid, square and free of defects, warp or buckles.

C. Form edge bends true and straight with minimum radius for thickness of material used.

D. Fabricate flush doors from single sheet steel material. Door face sheets shall be joined at their vertical edges by a continuous weld extending full height of door. See “continuously welded” in the Glossary of Terms for Hollow Metal Doors and Frames, HMMA 801. Edge welding seam shall be dressed.

E. Install specified hardware reinforcement and anchors.

F. Install specified hardware enclosures, junction boxes and conduits to doors and frames interconnecting electric operated hardware, monitoring devices, keeper switches, key switches, call buttons, electric hinges,intercom stations, intercommunication devices and other similar electrical items specified in security hard-ware section and in electronic security systems sections. Coordinate fabrication work to provide for complete concealed installation of conduits, junction boxes and hardware enclosures.

G. After fabrication, all vertical edges and weld joints shall be sanded per manufacturer standard. After appropriate metal preparation, all exposed surfaces of quoted security hollow metal items shall receive a rust inhibitiveprimer which meets or exceeds ASTM B 117. Salt spray for 150 hours with a rust grade of not less than 6as defined in ASTM D 610 and ASTEM D 1735 Water Fog Test for organic coatings for 200 hours with any quantity of #8 blisters but no more than “few” #6 blisters as illustrated in ASTM D 714.

H. Manufacturing Tolerances: Comply with tolerance limits specified in referenced HMMA 863 standard.

I. Clearances: Fabricate swinging doors to provide edge clearances as specified.

1. Between door and frame, at head and jambs: 0.125-inch (1/8").
2. At meeting edges of pairs of doors: 0.125-inch (1/8").
3. At sills without thresholds: 0.075-inch (3/4”) above finish floor; unless otherwise

noted where door undercuts are required.

4. At sills with thresholds: 0.125-inch (1/8") maximum above top of thresholds.

5. At sills of fire-rated doors: Comply with requirements of NFPA 80 but not exceeding clearances specified for non-rated doors.

J. Shop Priming:

1. Clean steel surfaces of mill scale, rust, oil, grease, dirt or other foreign materials. Prep surfaces for paint adhesion in accordance with manufacturer's standard procedures meeting specified requirements.

2. Apply shop coat rust-inhibitive primer to provide an even, consistent and uniform finished sur- face. Coat surfaces with specified primer to achieve minimum 1 to 1-1/2 mils dry film thickness.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install security hollow metal doors and frames plumb, level, square, rigid, aligned and anchored in position in accordance with final reviewed and accepted shop drawings, manufacturer's product data and ANSI/NAAMM/HMMA 840-99 Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames ANSI/NAAMM HMMA 863 standard.

B. Frames Erection:

1. Erect frames in strict compliance within permissible installation tolerances specified in referenced HMMA 863 standard.

2. Set frames in position prior to beginning construction of partitions and walls. Brace frames until permanent anchors are set.

3. Secure floor anchors at each jamb and mullion anchored to substrate.

a. Install anchors for frames as work progresses unless anchors are furnished welded in frames. Position wall anchors at hinge and strike levels, including at additional locations specified.

b. Build-in specified wall anchors for frames installed in masonry security walls as work is constructed. Install specified jamb and head anchors with holes in straps aligned for insertion of reinforcement bars to secure frames to wall construction.

c. Install frames in prepared openings of in-place concrete or masonry wall construction using specified anchors at spacing and locations indicated.

4. Install fire-rated frames in accordance with NFPA 80-1995 using labeled anchors and same methods specified for installation in security walls.

5. Install frames to security drywall construction with specified anchors at spacings indicated and attached to framing positioned in door frame throat. Attach metal stud framing to each jamb anchor with minimum two fasteners. Secure floor anchors at each frame jamb to substrate.

C. Grout Filling Frames:

1. Grout jambs, heads, and sills of frames installed in masonry or concrete openings, full and solid.

   a. Hand trowel grout of specified slump consistency in place to fill frame cavities. If slump of grout is greater than 5-inches to be used, take special precautions to protect and seal tapped holes, electrical knock-outs, lock pockets, grout guards, junction boxes and similar items located in frames.

   b. Perform grouting of frames in lifts or provide methods to ensure that frames are not de-formed or damaged by hydraulic forces produced during this process.

   c. Where frames fabricated with grout access holes are used, continuous weld steel plugclosure plates to frame after completion of grouting work.

      1) Grind, dress and finish welds smooth to blend with adjacent surfaces.

      2) Touch-up primer finishes and galvanized surfaces of frame where applicable sothat plugs are indiscernible.

D. Door Installation:

1. Install security hollow metal doors in frames, plumb and align using hardware specified in Security Hardware section.

2. Install doors maintaining uniform edge clearances not to exceed requirements specified for fabrication and aligned with frame face when in closed position.

3. Install fire-rated doors in accordance with requirements of NFPA 80-1995. Do not remove fire labels from doors.

4. Doors shall be installed to ensure proper operation and performance. Rehang and adjust doors, which bind or sag. Adjust sill clearances as required to prevent scuffing of finish flooringin normal door operation.

5. When required, install full metal hinge shims to adjust doors to maintain clearanceswithin specified tolerances.

6. Replace doors having defects in material, finish, fit or machining.

E. Perform field drilling and taping for surfaced applied hardware complying with recommendations of ANSIA250.6-1997.

3.2 CLEANING, ADJUSTING AND PROTECTION

A. Upon completion of installation, clean and touch-up damaged shop-primed surfaces including field welds.Sand rusted or damaged areas smooth and apply compatible air-drying primer to surfaces.

B. Verify proper fit and operation of doors. Make adjustments as required to ensure smooth, quiet operation.Re-hang or replace doors which bind or sag.

C. Replace components, which exhibit warp, buckle or broken welds, and components, which cannot be adjusted.

3.3 WARRANTY

A. Warranty is one year from date of project substantial completion.

End of Section 08 34 63

SECTION 08 36 13 - SECTIONAL DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Electrically operated sectional doors.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For units with factory-applied finishes.

1. Include Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sectional doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

B. Regulatory Requirements: Comply with applicable provisions in ICC A117.1.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Failure of components or operators before reaching required number of operation cycles.
c. Faulty operation of hardware.
d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
e. Delamination of exterior or interior facing materials.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain sectional doors from single source from single manufacturer.

1. Obtain operators and controls from sectional door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.

1. Design Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa), acting inward and outward.
2. Testing: According to ASTM E 330 or DASMA 108 for garage doors and complying with the acceptance criteria of DASMA 108.
3. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.

    a. Deflection of door sections in horizontal position (open) shall not exceed 1/120 of the door width.
    b. Deflection of horizontal track assembly shall not exceed 1/240 of the door height.

4. Operability under Wind Load: Design overhead coiling doors to remain operable under uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa) wind load, acting inward and outward.

C. Seismic Performance: Sectional doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.5.

2.3 DOOR ASSEMBLY

A. Steel Sectional Door: Sectional door formed with hinged sections and fabricated according to DASMA 102 unless otherwise indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, provide > or comparable product by one of the following:

    a. C.H.I. Overhead Doors, Inc; Model 3242 Insulated 24 Gauge Ribbed Steel Door with Steel Back Cover.
    b. Clopay Building Products; Premium Duty Model 3722 (2" Thick, R-18.4, 20 Ga Ext).
    c. Overhead Door Corporation.
    d. Raynor.
    e. Wayne-Dalton Corp.

B. Operation Cycles: Door components and operators capable of operating for not less than 50,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

C. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. (0.406 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to ASTM E 283.

D. Installed R-Value: 15.0 deg F x h x sq. ft./Btu (2.642 K x sq. m/W).

E. Steel Sections: Zinc-coated (galvanized) steel sheet with G90 (Z275) zinc coating.

1. Section Thickness: 2 inches (51 mm).
2. Exterior-Face, Steel Sheet Thickness: 0.040-inch-(1.02-mm-) nominal coated thickness.

a. Surface: Flat.
b. Surface: Manufacturer's standard, ribbed.

3. Interior Facing Material: Zinc-coated (galvanized) steel sheet with a nominal coated thickness of 0.028 inch (0.71 mm).

F. Track Configuration: Standard-lift track.

G. Roller-Tire Material: Case-hardened steel.

H. Locking Devices: Equip door with locking device assembly.

1. Locking Device Assembly: Cremone type, both jamb sides, locking bars, operable from inside and outside, with cylinders.

I. Counterbalance Type: Torsion spring.

J. Door Finish:

1. Baked-Enamel or Powder-Coat Finish: Color and gloss as selected by Architect from manufacturer's full range.
2. Finish of Interior Facing Material: Finish as selected by Architect from manufacturer's full range.

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 STEEL DOOR SECTIONS

A. Exterior Section Faces and Frames: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated zinc coating and thickness.

1. Fabricate section faces from single sheets to provide sections not more than 24 inches (610 mm) high and of indicated thickness. Roll horizontal meeting edges to a continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove weather-resistant seal, with a reinforcing flange return.

B. Section Ends and Intermediate Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet not less than 0.064-inch-(1.63-mm-)nominal coated thickness and welded to door section. Provide intermediate stiles formed from not less than 0.064-inch-(1.63-mm-)thick galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches (1219 mm) apart.

C. Reinforce bottom section with a continuous channel or angle conforming to bottom-section profile and allowing installation of astragal.

D. Provide reinforcement for hardware attachment.

E. Interior Facing Material: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated thickness.

F. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

2.6 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances indicated on Drawings, Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides for required door type, size, weight, and loading.

1. Galvanized Steel: ASTM A 653/A 653M, minimum G60 (Z180) zinc coating.
2. Slope tracks at an angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.
3. Track Reinforcement and Supports: Galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced 2 inches (51 mm) apart for door-drop safety device.

    a. For Vertical Track: Intermittent, jamb brackets attached to track and attached to wall.
    b. For Horizontal Track: Continuous reinforcing angle from curve in track to end of track, attached to track and supported at points by laterally braced attachments to overhead structural members.

B. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.

2.7 HARDWARE

A. General: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.

B. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch-(2.01-mm-)nominal coated thickness at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is impossible. Provide double-end hinges where required, for doors more than 16 feet (4.88 m) wide unless otherwise recommended by door manufacturer.

C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch-(76-mm-)diameter roller tires

for 3-inch-(76-mm-)wide track and 2-inch-(51-mm-)diameter roller tires for 2-inch-(51-mm-)wide track.

2.8 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded deadbolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Cylinders and keyed to building keying system.
2. Keys: Three for each cylinder.

B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.9 COUNTERBALANCE MECHANISM

A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A 229/A 229M, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.

B. Cables: Galvanized-steel, multistrand, lifting cables with cable safety factor of at least 7 to 1.

C. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.

D. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.

E. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.

2.10 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.

1. Trolley: Trolley operator mounted to ceiling above and to rear of door in raised position and directly connected to door with drawbar.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.

1. Electrical Characteristics:

a. Phase: Single phase.
b. Volts: 208.
c. Hertz: 60.

2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
3. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
5. Use adjustable motor-mounting bases for belt-driven operators.

E. Limit Switches: Equip motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Device: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.

1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom section. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

a. Self-Monitoring Type: Four-wire configured device designed to interface with door-operator control circuit to detect damage to or disconnection of sensor edge.

G. Automatic closing control to close the door by timer set by the owner to a predetermined time to close the door after the door has opened completely.

H. Portable, Radio-Control System: Provide 8 units for each of the openers, consisting of the following:

1. Three-channel universal coaxial receiver to open, close, and stop door.
2. Portable control device to open and stop door may be momentary-contact type; control to close door shall be sustained- or constant-pressure type.
3. Remote antenna and mounting kit.

I. Door operator shall be equipped with input and logic to open specific door based upon contact-closure by the 911 communications room (single manual switch control). Coordinate all functions and features with electrical contractor. Electrical contractor will provide manual activation switch(s) at the communications room and all wiring and conduit to each operator as well as terminations at the operator in close coordination with the door installer.

2.11 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Tracks:

1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches (610 mm) apart.
2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.

C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

D. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

3.3 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust doors and seals to provide weather-resistant fit around entire perimeter.

D. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 08 36 13

Section 08 41 13 – ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

1. GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. General Contractor provide aluminum-framed entrances and storefronts as shown and herein specified

a. Install New:

1) Exterior and interior storefront framing.
2) Storefront framing for window walls.
3) Storefront framing for punched openings.
4) Exterior manual-swing entrance doors and door-frame units.
5) Interior manual-swing entrance aluminum doors and door-frame units.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

G. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Preconstruction Laboratory Mockup Testing Submittals:

1. Testing Program: Developed specifically for Project.
2. Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.
3. Record Drawings: As-built drawings of preconstruction laboratory mockups showing changes made during preconstruction laboratory mockup testing.

B. Qualification Data: For Installer and field testing agency.

C. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

D. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency.

E. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.

F. Source quality-control reports.

G. Field quality-control reports.

H. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C 1401 recommendations for post-installation-phase quality-control program.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Laboratory Mockup Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

C. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

E. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of storefront systems.

1.7 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.

2. Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION LABORATORY MOCKUPS

A. Preconstruction Testing Service: Provide documentation indicating a qualified testing agency has performed testing on preconstruction laboratory mockups.

B. If documentation does not exist, build preconstruction laboratory mockups at testing agency facility; use personnel, products, and methods of construction similar to that which will be used at Project site.

C. Preconstruction Laboratory Mockup Testing Program: Test preconstruction laboratory mockups according to requirements in "Performance Requirements" Article. Perform the following tests in the following order:

1. Structural: ASTM E 330 at 50 percent of positive test load.
2. Air Infiltration: ASTM E 283.
3. Water Penetration under Static Pressure: ASTM E 331.
4. Water Penetration under Dynamic Pressure: AAMA 501.1.
5. Structural: ASTM E 330 at 100 percent of positive and negative test loads. Repeat the following:

    a. Air Infiltration: ASTM E 283.
    b. Water Penetration under Static Pressure: ASTM E 331.

6. Thermal Cycling: According to AAMA 501.5. Repeat the following:

    a. Air Infiltration: ASTM E 283.
    b. Water Penetration under Static Pressure: ASTM E 331.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures including, but not limited to, excessive deflection.
    b. Noise or vibration created by wind and thermal and structural movements.
    c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of Substantial Completion.

2. PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.

    a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:

    a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.

E. Structural: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

    a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

2. Entrance Doors:

    a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
    b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..

H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..
2. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

I. Interstory Drift: Accommodate design displacement of adjacent stories indicated.

1. Design Displacement: As indicated on Drawings.
2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.

J. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.

K. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.45 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.

L. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.

1. Outdoor-Indoor Transmission Class: Minimum 26.

M. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone 4.

1. Large-Missile Test: For glazed openings located within 30 feet of grade.

N. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

    a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
    b. Low Exterior Ambient-Air Temperature: 0 deg F.
    c. Interior Ambient-Air Temperature: 75 deg F.

O. Structural-Sealant Joints:

1. Designed to carry gravity loads of glazing.
2. Designed to produce tensile or shear stress of less than 20 psi.

P. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed storefront system without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.

1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Arcadia, Inc.
2. Arch Aluminum & Glass Co., Inc.
3. CMI Architectural.
4. Commercial Architectural Products, Inc.
5. EFCO Corporation.
6. Kawneer North America.
7. Leed Himmel Industries, Inc.
8. Oldcastle BuildingEnvelope.
9. Pittco Architectural Metals, Inc.
10. TRACO.
11. Tubelite.
12. United States Aluminum.
13. YKK AP America Inc.

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing spandrel panels and accessories, from single manufacturer.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.
4. Finish: Color anodic finish.
5. Fabrication Method: Field-fabricated stick system.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

a. Sheet and Plate: ASTM B 209.
b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
d. Structural Profiles: ASTM B 308/B 308M.

2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 2-inch overall thickness, with minimum 0.188-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners

with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: Medium stile; 3-1/2-inch nominal width.
3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide nonremovable glazing stops on inside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

B. General: Provide entrance door hardware for each entrance door to comply with requirements in this Section.

1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
3. Opening-Force Requirements:

a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbfto set the door in motion and not more than 15 lbf to open the door to its minimum required width.
b. Accessible Interior Doors: Not more than 5 to fully open door.

C. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in "Entrance Door Hardware Sets" Article.
2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

D. Butt Hinges: BHMA A156.1, Grade 1, radius corner.

1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
2. Exterior Hinges: Stainless steel, with stainless-steel pin.

3. Quantities:

    a. For doors up to 87 inches high, provide three hinges per leaf.

E. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

F. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

G. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

H. Silencers: BHMA A156.16, Grade 1.

2.6 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers. Comply with Section 088000 "Glazing."

C. Glazing Sealants: Comply with Section 088000 "Glazing."

D. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L.

E. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

F. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront system indicated.

1. Color: As selected by Architect from manufacturer's full range of colors.

G. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.

1. Color: Match structural sealant.

2.7 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

F. Storefront Framing: Fabricate components for assembly using head-and-sill-receptor system with shear blocks at intermediate horizontal members.

G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

H. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

I. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
1. Color: As selected by Architect from full range of industry colors and color densities.

2.10 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

3. EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 088000 "Glazing."

G. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet ; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:

    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Architect/Engineer will engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

    a. Perform a minimum of two tests in areas as directed by Architect.
    b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.

C. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.

1. Test a minimum of four areas on each building facade.
2. Repair installation areas damaged by testing.

D. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Using Agency's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

END OF SECTION 08 41 13

SECTION 08 56 19 - PASS-THRU WINDOWS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Insulated Bi-Parting Windows.

1.2 RELATED SECTIONS

A. Section 07620 (07 62 00) – Sheet Metal Flashing and Trim.

B. Section 07920 (07 92 00) – Joint Sealants.

1.3 REFERENCES

A. ASTM A 240 – Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.

B. ASTM A 653 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM B 209 – Aluminum and Aluminum-Alloy Sheet and Plate.

D. ASTM B 221 – Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

E. ASTM C 1048 – Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass.

1.4 SUBMITTALS

A. Comply with Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's product data, including materials, components, fabrication, finish, and installation instructions.

C. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, fabrication, glazing, fasteners, hardware, finish, electrical wiring diagrams, options, and accessories.

D. Samples: Submit manufacturer's samples of standard finishes.

E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.

F. Manufacturer's Project References: Submit list of successfully completed pass-thru window projects, including project name and location, name of architect, and type and quantity of pass-thru windows installed.

G. Operation and Maintenance Manual: Submit manufacturer's operation and maintenance manual, including operation, maintenance, adjustment, and cleaning instructions, trouble

shooting guide, parts list, and electrical wiring diagrams.

H. Warranty: Submit manufacturer's standard warranty.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Minimum of 20 years successful experience continuously manufacturing pass-thru windows.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.

C. Handling: Protect materials and finish from damage during handling and installation.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Ready Access, Inc., 1815 Arthur Drive, West Chicago, Illinois 60185. Toll Free (800) 621-5045. Phone (630) 876-7766. Fax (630) 876-7767. Web Site www.ready-access.com. E-Mail ready@ready-access.com.

B. Substitutions: Allowed, with prior written approval by Architect.

2.2 FLUSH-MOUNTED PASS-THRU WINDOWS

A. Flush-Mount Pass-Thru Windows: 606-72 Insulated Bi-Parting Window.
1. Service Opening: 30”W x 32.5”H
2. Door Operation: Manual Open, Self-Closing
3. Door Type: Bi-parting sliding, 2 door panels.
4. Opening Direction: Part from center, simultaneous opening. Customer View – Outside
5. Frame: Extruded aluminum, ASTM B 221, Alloy 6063-T6 and 6063-T52.
6. Aluminum Sheet: ASTM B 209, Alloy 5005-AQ-H34.
7. Galvanized Steel Sheet: ASTM A 653, G90.
8. Bottom Sill: Angled downward, track-free.
10. Fasteners: Stainless steel rivets and hex-head zinc-plated self-threading machine screws.
11. Handle: Stainless steel.
12. Security: Automatically locks each time door closes. Manual security locks
13. Lock: Self-latching Adams Rite MS1847 Series with Adams Rite 1000 Series turn.
14. Glazing: 1/4-inch tempered glass, ASTM C 1048, tinted at interior installation location and optional Solarban 70XL Insulated Low-E Glazing at exterior installation location
15. Silicone Glazing Sealant: Dow Corning 999A, aluminum.
16. Shelf: Exterior/interior, stainless steel, 28 inches wide by 10 inches deep.

2.4 FABRICATION

A. Assembly: Factory assembled, factory glazed.

2.5 ALUMINUM FINISH

A. Anodized:
1. Clear, AA-M10-C12-C22-A31, ASTM B 680.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive pass-thru windows. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Ensure openings to receive pass-thru windows are plumb, level, square, accurately aligned, correctly located, and in tolerance.

3.3 INSTALLATION

A. Install pass-thru windows in accordance with manufacturer's instructions.

B. Install pass-thru windows plumb, level, square, true to line, and without warp or rack.

C. Install pass-thru window components weathertight.

D. Anchor pass-thru windows securely in place to supports. Use attachment methods permitting adjustment for construction tolerances, irregularities, alignment, and expansion and contraction.

E. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by Architect.

F. Sheet Metal Flashing: Install sheet metal flashing as specified in Section 07 62 00.

G. Joint Sealants: Install joint sealants as specified in Section 07 92 00.

I. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

J. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 ADJUSTING

A. Adjust doors to be weathertight in closed position.

B. Adjust doors and operating hardware to function properly and for smooth operation without binding.

3.5 CLEANING

A. Clean pass-thru windows promptly after installation in accordance with manufacturer's instructions.

B. Remove excess joint sealant in accordance with sealant manufacturer's instructions.

C. Do not use harsh cleaning materials or methods that would damage glazing or finish.

3.6 PROTECTION

A. Protect installed pass-thru windows to ensure that, except for normal weathering, pass-thru windows will be without damage or deterioration at time of substantial completion.

END OF SECTION 08 56 19

SECTION 085653 - SECURITY WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vision security windows.

B. Related Requirements:

1. Section 013513.16 "Special Project Procedures for Detention Facilities" for general requirements for detention work.
2. Section 083463 "Detention Doors and Frames" for detention-grade hollow-metal windows, sidelights, and door transoms.
3. Section 099123 "Interior Painting" for field painting interior security windows.

1.3 COORDINATION

A. Coordinate installation of anchorages for security windows. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in adjacent construction. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for window units.

B. Shop Drawings: For security windows.

1. Include plans, elevations, sections, and attachments to other work.
2. Full-size section details of framing members, including internal armoring, reinforcement, and stiffeners.
3. Location of weep holes.
4. Hardware for sliding window units.

5. Glazing details.

C. Samples for Initial Selection: For frame members with factory-applied color finishes.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of security window and accessory indicated as ballistics resistant, for tests performed by a qualified testing agency.

B. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation of units required for this Project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Pack security windows in wood crates for shipment. Crate glazing separate from frames unless factory glazed.

B. Label security window packaging with drawing designation.

C. Store crated security windows on raised blocks to prevent moisture damage.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 SEQUENCING

A. Field Painting: Except where security windows have been preglazed before installation, complete field painting of security windows before glazing installation.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace security windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including deflections exceeding 1/4 inch (6 mm).
b. Failure of welds.
c. Excessive air leakage.

d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Attack Resistance: Provide units identical to those tested for compliance with requirements indicated, and as follows:

1. Ballistics Resistance: Level 8 when tested according to UL 752.

B. Structural Loads: Detention windows shall withstand the effects of wind loads, with no permanent deformation or breakage of components within window assembly when tested according to ASTM E 330.

1. Wind Loads: As indicated on Drawings.

2.2 VISION SECURITY WINDOWS

A. Provide fixed vision security windows with framing on four sides and no operable sash or ventilator.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide. or comparable product by one of the following:

a. Action Bullet Resistant Corp.
b. American Vault Corporation.
c. Armortex.
d. Chicago Bullet Proof Systems.
e. Collier Division, SSE, LLC.
f. Creative Industries, Inc.
g. Diebold, Incorporated.
h. Hamilton Safe.
i. Laurence, C. R. Co., Inc.
j. National Bullet Proof, Inc.
k. Norshield Products Group.
l. Overly Door Company.
m. Quikserv Corp.
n. SABIC Innovative Plastics IP BV; Insulgard Security Products.
o. United States Bullet Proofing, Inc.

B. Framing: Fabricate perimeter framing, mullions, and glazing stops from steel as follows:

1. Profile: Manufacturer's standard, with minimum face dimension indicated.

a. Minimum Face Dimension: 2 inches (50 mm).

2. Depth: Manufacturer's standard.
3. Glass Orientation: Vertical.

C. Glazing and Glazing Materials: Comply with requirements in Section 088853 "Security Glazing."

D. Materials:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, CS (Commercial Steel), Type B; suitable for exposed applications.

2.3 FABRICATION

A. General: Fabricate security windows to provide a complete system for assembly of components and anchorage of window units.

1. Provide units that are reglazable from the secure side without dismantling the nonsecure side of framing.
2. Prepare security windows for glazing unless preglazing at the factory is indicated.

B. Provide weep holes and internal water passages for exterior security windows to conduct infiltrating water to the exterior.

C. Framing: Miter or cope corners the full depth of framing; weld and dress smooth.

1. Fabricate framing with manufacturer's standard, internal opaque armoring in thicknesses required for security windows to comply with ballistics-resistance performance indicated.

D. Glazing Stops: Finish glazing stops to match security window framing.

1. Secure-Side (Exterior) Glazing Stops: Welded or integral to framing.
2. Nonsecure-Side (Interior) Glazing Stops: Removable, coordinated with glazing indicated.

E. Welding: Weld components to comply with referenced AWS standard. To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

F. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

G. Factory-cut openings in glazing for speaking apertures.

H. Preglazed Fabrication: Preglaze window units at factory, where required for applications indicated. Comply with requirements in Section 088853 "Security Glazing."

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 STEEL FINISHES

A. Steel Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

2.6 ACCESSORIES

A. Concealed Bolts: ASTM A 307, Grade A unless otherwise indicated.

B. Compression-Type Glazing Strips and Weather Stripping: Unless otherwise indicated, provide compressible stripping for glazing and weather stripping, such as molded EPDM or neoprene gaskets complying with ASTM D 2000, Designations 2BC415 to 3BC620; molded PVC gaskets complying with ASTM D 2287; or molded, expanded EPDM or neoprene gaskets complying with ASTM C 509, Grade 4.

C. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers and with a proven record of compatibility with surfaces contacted in installation.

1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
2. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.
3. Spacers: Elastomeric blocks or continuous extrusions with a Type A Shore durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

D. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, complying with ASTM B 633; provide sufficient strength to withstand design pressures indicated.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Sealants: For sealants required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Sealant shall remain permanently elastic, nonshrinking, and nonmigrating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of security windows.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of security windows.

D. Inspect built-in and cast-in anchor installations, before installing security windows, to verify that anchor installations comply with requirements. Prepare inspection reports.

1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
2. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.

E. For glazing materials whose orientation is critical for performance, verify installation orientation.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other security window anchors whose installation is specified in other Sections.

3.3 INSTALLATION

A. Glazed Framing: Provide gasket-glazed framing. Comply with installation requirements in Section 088853 "Security Glazing."

B. Removable Glazing Stops and Trim: Fasten components with security fasteners.

C. Fasteners: Install security windows using fasteners recommended by manufacturer with head style appropriate for installation requirements, strength, and finish of adjacent materials.

D. Sealants: Comply with requirements in Section 079200 "Joint Sealants" for installing sealants, fillers, and gaskets.

1. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction unless otherwise indicated.

2. Seal frame perimeter with sealant to provide weathertight construction unless otherwise indicated.

E. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.4 ADJUSTING

A. Remove and replace defective work, including security windows that are warped, bowed, or otherwise unacceptable.

3.5 CLEANING AND PROTECTION

A. Clean surfaces promptly after installation of security windows. Take care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.

B. Clean glass of preglazed security windows promptly after installation. Comply with requirements in Section 088853 "Security Glazing" for cleaning and maintenance.

C. Provide temporary protection to ensure that security windows are without damage at time of Substantial Completion.

END OF SECTION 08 56 53

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.
4. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “Bullet Resistant Doors and Frame”.
4. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
5. Division 08 Section “Automatic Door Operators”.
6. Division 08 Section “Detention Door Hardware”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
   h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

   a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
   b. Complete (risers, point-to-point) access control system block wiring diagrams.
   c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Automatic Operator Supplier Qualifications: Power operator products and accessories are required to be supplied and installed through the Norton Preferred Installer (NPI) program. Suppliers are to be factory trained, certified, and a direct purchaser of the specified power operators and be responsible for the installation and maintenance of the units and accessories indicated for the Project.

F. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

G. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

H. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

I. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.

2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

J. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.
   d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

   a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
   b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

   a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

   a. Hager Companies (HA) - BB Series, 5 knuckle.
   b. Ives (IV) - 5BB Series, 5 knuckle.
   c. McKinney (MK) - TA/T4A Series, 5 knuckle.

2.3 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

a. Hager Companies (HA).
b. Pemko (PE).
c. Select Hinges (SL).

2.4 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets with a 1-year warranty. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Hager Companies (HA) - ETW-QC (# wires) Option.
b. Ives (IV) - Connect.
c. McKinney (MK) - QC (# wires) Option.

B. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Pemko (PE) - EL-CEPT Series.
b. Securitron (SU) - EL-CEPT Series.
c. Von Duprin (VD) - EPT-10 Series.

C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. Hager Companies (HA) - Quick Connect.
b. McKinney (MK) - QC-C Series.
c. Von Duprin (VD) - Connect.

2.5 DOOR OPERATING TRIM

A. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

6. Manufacturers:

a. Burns Manufacturing (BU).
b. Rockwood (RO).
c. Trimco (TC).

2.6 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

1. Manufacturers:

a. Match Existing, Field Verify.
b. No Substitution.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.

5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Match Facility Restricted Keyway.

C. Small Format Interchangeable Cores: Provide small format interchangeable cores (SFIC) as specified, core insert, removable by use of a special key; usable with other manufacturers' cylinders.

D. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer’s United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.

1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.

2. Manufacturers:

   a. dormakaba Best (BE) - CORMAX.
   b. No Substitution.

E. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

F. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

G. Construction Keying: Provide construction master keyed cylinders.

H. Construction Keying: Provide temporary keyed construction cores.

I. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.7 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Heavy duty mortise locks shall have a ten-year warranty.

2. Where specified, provide status indicators with highly reflective color and wording for “locked/unlocked” or “vacant/occupied” with custom wording options if required. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status. Indicator window size to be a minimum of 2.1” x 0.6” with a curved design allowing a 180-degree viewing angle with protective covering to prevent tampering.

3. Manufacturers:

   a. Corbin Russwin Hardware (RU) - ML2000 Series.
   b. Sargent Manufacturing (SA) - 8200 Series.
   c. Schlage (SC) - L9000 Series.

2.8 ELECTROMECHANICAL LOCKING DEVICES

A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed, subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below and in the hardware sets.

1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.
2. Manufacturers:

   a. Corbin Russwin Hardware (RU) - ML20900 Series.
   b. Sargent Manufacturing (SA) - 8200 Series.
   c. Schlage (SC) - L9000 EL/EU/RX Series.

2.9 AUXILIARY LOCKS

A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.36, Grade 1, small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.

1. Manufacturers:

    a. Corbin Russwin Hardware (RU) - DL4000 Series.
    b. Sargent Manufacturing (SA) - 4870 Series.
    c. Schlage (SC) - L460 Series.

2.10 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.11 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.

2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

6. Flush End Caps: Provide flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.

7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.

10. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

11. Rail Sizing: Provide exit device rails factory sized for proper door width application.

12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

    1. Manufacturers:

        a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
        b. Von Duprin (VD) - 35A/98 XP Series.

C. Security Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed rim panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be constructed of high grade, heat treated, corrosion resistant nickel steel alloy, and have a full 3/4" throw projection with slide action positive deadlocking.

    1. Static Load Force Resistance: Minimum 3000 lbs certified independent tested.

2. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ED4000S / ED5000S Series.

D. Steel Removable Mullions: ANSI/BHMA A156.3 steel removable mullions with options for fire rating, locking, through-wire electrification and hurricane compliance as specified.

1. Manufacturers:

    a. Same as exit device manufacturer.

2.12 ELECTROMECHANICAL EXIT DEVICES

A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.

1. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.

2. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.

3. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ED5000 Series.
    b. Sargent Manufacturing (SA) - 80 Series.
    c. Von Duprin (VD) - 35A/98 XP Series.

2.13 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible

to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Large body cast iron surface mounted door closers shall have a 30-year warranty.

2. Manufacturers:

   a. Corbin Russwin Hardware (RU) - DC8000 Series.
   b. Norton Rixson (NO) - 9500 Series.
   c. Sargent Manufacturing (SA) - 281 Series.

2.14 ELECTROMECHANICAL DOOR OPERATORS

A. Electromechanical Door Operators (High Traffic): Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that are UL325/991 and UL10C certified and comply with requirements for the Americans with Disabilities Act (ADA). Operators shall accommodate openings up to 250 pounds and 48” wide.

1. Provide operators with features as follows:

   a. Non-handed with push and pull side mounting.
   b. Activation by push button, hands-free or radio frequency devices.
   c. Adjustable opening force and closing power.
   d. Two-year limited warranty.
   e. Wi-Fi interface.
   f. Mounting backplate to simplify and speed up installation.
   g. Integration with access control systems.

2. Operators shall have the following functionality:

a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.
b. Blow Open for Smoke Ventilation: Door opens when signal is received from alarm system allowing air or smoke to flow through opening. Door will stay open until signal from alarm system is stopped.
c. Emergency Interface Relay: Door closes and ignores any activation input until signal is discontinued.
d. Infinite Hold Open: Door will hold open at set position until power is turned off.
e. Latch Assist: At closed position, after an activation, the door is pulled in. After the door has closed, the door is pulled in to assist with latch release/engagement.
f. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.
g. Open Delay: Delays operator opening for locking hardware.
h. Outside Wall Switch Disable: When contact is closed, outside wall switch is disabled.
i. Power Assist: Senses the door is being opened manually and applies small amount of power to assist the user in opening the door with force less than 5 lbs. The door opens only as far as it is moved manually, then closes once released.
j. Power Close: Additional force to assist door closing between 7° and 2°.
k. Presence Detector Input: Input for external sensor to detect presence at door open or close position only.
l. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.
m. Selector Mode Switch: Off disables the signal inputs unless Blow Open is activated, on activates the signal inputs, hold open activates the unit (unless Blow Closed is activated) to the hold open position.
n. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open. Second door will open once vestibule door delay has expired. Delay is adjustable.
o. Executive Mode Feature: When the door receives an activation signal it opens and remains open until either a second signal is received, or the door is manually moved in closing direction.

3. Manufacturers:

a. ASSA ABLOY Entrance Systems (BE) - SW200 Series.
b. Horton Automatics (HO) - S4100LE Series.
c. Norton Rixson (NO) - 6300 Series.

2.15 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

    a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Rockwood (RO).
    c. Trimco (TC).

2.16 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Rockwood (RO).
    c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of

extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

    a. Norton Rixson (RF).
    b. Rockwood (RO).
    c. Sargent Manufacturing (SA).

2.17 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. National Guard Products (NG).
2. Pemko (PE).
3. Reese Enterprises, Inc. (RE).

2.18 ELECTRONIC ACCESSORIES

A. Push-Button Switches: Industrial grade momentary or alternate contact, back-lighted push buttons with stainless-steel switch enclosures. 12/24 VDC bi-color illumination suitable for either flush or surface mounting.

1. Manufacturers:

    a. Alarm Controls (AK) - TS Series.
    b. Security Door Controls (SD) - 400 Series.
    c. Securitron (SU) - PB Series.

B. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

    a. Sargent Manufacturing (SA) - 3280 Series.
    b. Security Door Controls (SD) - DPS Series.
    c. Securitron (SU) - DPS Series.

C. Wiegand Test Unit: Test unit verifies proper Wiegand output integrated card reader lock installation in the field by testing for proper wiring, card reader data integrity, and lock functionality including lock/unlock, door position, and request-to-exit status. 12 or 24VDC voltage adjustable operating as Fail Safe or Fail Secure.

1. Manufacturers:

    a. Corbin Russwin Hardware (RU) - WT2 Wiegand Test Unit.
    b. Sargent Manufacturing (SA) - WT2 Wiegand Test Unit.

D. Switching Power Supplies: Provide power supplies with either single or dual voltage configurations at 12 or 24VDC. Power supplies shall have battery backup function with an integrated battery charging circuit and shall provide capability for power distribution, direct lock control and Fire Alarm Interface (FAI) through add on modules. Power supplies shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs.

1. Manufacturers:

    a. Securitron (SU) - AQD Series.
    b. Altronix (AS) - Maximal 3.

2.19 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.20 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Power Operator products and accessories are required to be installed through current members of the manufacturer's "Power Operator Preferred Installer" program.

D. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.5 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.6 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.7 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SU - Securitron
4. RU - Corbin Russwin
5. BE - BEST Locks & Closers
6. RO - Rockwood
7. RF - Rixson
8. NO - Norton
9. SA - SARGENT
10. OT - Other

Hardware Sets

Set: 1.0

Doors: 130

2	Continuous Hinge	DFM_SLF-HD1 PT x Length Required		PE	087100
2	Electric Power Transfer	EL-CEPT	613E	SU	087100
1	Narrow CVR Exit Device (NL, RX, ELR, CD)	ED4800 O859ET M110 M92 MELR M52 CTxSD (Cyl. Dogging)	630	RU	087100
1	Narrow CVR Exit Device (EO, RX, CD)	ED4800 EO M110 M92 M52 (Cyl. Dogging)	630	RU	087100
2	SFIC Cylinder Housing	Size and Cam as required	626	BE	087100
3	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
2	Door Pull	RM3331-36 Mtg-Type 12XHD	US32D	RO	087100
1	Drop Plate	754F25	689	RU	087100
1	Surface Closer	DC8210 A11 M77/M78 (HD PA SPG STP Arm)	689	RU	087100
1	Automatic Opener	6310 / 6330 (As Required)	689	NO	087100
2	Sweep	3452DNB x Length Required		PE	087100
1	Threshold	273x224AFGT x Length Required x MSES25SS		PE	087100
1	Card Reader	By Security Supplier			
2	ElectroLynx Harness (Door)	QC-C**** x Length Required		MK	087100
2	ElectroLynx Harness (Frame)	QC-C1500P		MK	087100
1	Auto Actuator Switch	505		NO	087100
1	Bollard Post w/Auto Actuator Switch	500	689	NO	087100
2	Position Switch	DPS (DPDT)			087100
1	Power Supply	AQD (Size as required)		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: Perimeter and meeting stile gasket by door / frame manufacturer.

Operation:
• Doors normally closed and secure.
• When there is an authorized card read at the exterior, will release the exit device latch at the active leaf and activate the exterior auto operator actuator (Mounted to Bollard) to allow authorized manual or auto operator access, then relock.
• Assisted Egress is always available by pressing the vestibule auto operator actuator to retract

the exit device latch at the active leaf and activate the auto operator to open the door and then relock.
• Manual Egress, always free for immediate exit at either door. Request-to-Exit sensor integrated into the exit device push bar allows exit without alarm condition.
• Door position switches provide open/closed monitoring to both access control system and intrusion alarm service.
• Latch remains projected/locked (fail secure) in event of power loss. Key override cylinder for emergency access.

Set: 2.0

Doors: 105D

1	Continuous Hinge	DFM_SLF-HD1 PT x Length Required		PE	087100
1	Electric Power Transfer	EL-CEPT	613E	SU	087100
1	Narrow Rim Exit Device (NL, RX, ELR, CD)	ED4200S K157ET M110 M92 MELR M52 CTxSD	630	RU	087100
1	SFIC Cylinder Housing	Size and Cam as required	626	BE	087100
2	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
1	Door Pull	RM3331-36 Mtg-Type 12XHD	US32D	RO	087100
1	Drop Plate	754F25	689	RU	087100
1	Surface Closer	DC8210 A11 M77/M78 (HD PA SPG STP Arm)	689	RU	087100
1	Sweep	3452DNB x Length Required		PE	087100
1	Threshold	273x224AFGT x Length Required x MSES25SS		PE	087100
1	Card Reader	By Security Supplier			
1	ElectroLynx Harness (Door)	QC-C**** x Length Required		MK	087100
1	ElectroLynx Harness (Frame)	QC-C1500P		MK	087100
1	Position Switch	DPS (DPDT)			087100
1	Power Supply	AQD (Size as required)		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: Perimeter and meeting stile gasket by door / frame manufacturer.

Operation:
• Doors normally closed and secure.
• Access by valid credential presentation retracting the exit latch for a pre-determined time limit and then relocking.
• Egress always free for immediate exit. Request-to-Exit sensor integrated into the exit device push bar allows exit without alarm condition.

• Door position switches provide open/closed monitoring to both access control system and intrusion alarm service.
• Latch remains projected/locked (fail secure) in event of power loss. Key override cylinder for emergency access.

Set: 3.0

Doors: 101A

1	Continuous Hinge	DFM_SLF-HD1 PT x Length Required		PE	087100
1	Electric Power Transfer	EL-CEPT	613E	SU	087100
1	Narrow Rim Exit Device (NL, RX, ELR, CD)	ED4200S K157ET M110 M92 MELR M52 CTxSD	630	RU	087100
1	SFIC Cylinder Housing	Size and Cam as required	626	BE	087100
2	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
1	Door Pull	RM3331-36 Mtg-Type 12XHD	US32D	RO	087100
1	Automatic Opener	6310 / 6330 (As Required)	689	NO	087100
1	Sweep	3452DNB x Length Required		PE	087100
1	Threshold	273x224AFGT x Length Required x MSES25SS		PE	087100
1	Card Reader	By Security Supplier			
1	ElectroLynx Harness (Door)	QC-C**** x Length Required		MK	087100
1	ElectroLynx Harness (Frame)	QC-C1500P		MK	087100
1	Push Button	PB		SU	087100
2	Auto Actuator Switch	505		NO	087100
1	Position Switch	DPS (DPDT)			087100
1	Power Supply	AQD (Size as required)		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: Perimeter and meeting stile gasket by door / frame manufacturer.

Operation:
• Door is normally Electronically Dogged to allow assisted or manual push/pull entry egress.
• The exit device latch will be electronically held (electronically dogged) and the auto operator actuator on both sides is active to allow for manual or auto operator entry or egress.
• Pressing the auto operator actuator on either side of the opening will activate the auto operator to open the door.
• Manual push/pull is available for entry and egress.

When Required; as programmed through the access control system or via remote push button:
• When the Remote Push Button is pressed, the exit device latch is released and the exterior

auto operator actuator is inactive. An authorized card read at the exterior will release the exit device latch and activate the exterior auto operator actuator to allow authorized manual or auto operator access, then relock.
• Auto operator egress is allowed at all times by pressing the auto operator actuator in the vestibule.
• Manual egress is allowed at all time by pressing the exit device push bar. Request to exit switch in the exit device push bar will signal an authorized egress to the access control system.
• Door position switch provides open/closed monitoring to both access control system and intrusion alarm service.
• The exit device latch will be released in the event of a power outage or emergency alarm, (Fail Secure).

Set: 4.0

Doors: 125B

2	Hinge, Full Mortise, Hvy Wt	T4A3386 (NRP and Size as Required)	US32D	MK	087100
1	Hinge, Full Mortise, Hvy Wt (PWR TRNS)	T4A3386 QCx (# of Wires and Size as Required)	US32D	MK	087100
1	Rim Exit Device (EL Trim-Fail Sec., RX, CD)	ED5200S N9905ET M110 M92 M52 CTxSD (Cyl. Dogging)	630	RU	087100
1	SFIC Cylinder Housing	Size and Cam as required	626	BE	087100
2	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
1	Surface Closer	DC8210 A11 (HD PA SPG STP Arm)	689	RU	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Gasketing	303AS (Head & Jambs)		PE	087100
1	Rain Guard	346C x Width of Frame Head		PE	087100
1	Sweep	3452CNB x Length Required		PE	087100
1	Threshold	273x224AFGT x Length Required x MSES25SS		PE	087100
1	Card Reader	By Security Supplier			
1	ElectroLynx Harness (Door)	QC-C**** x Length Required		MK	087100
1	ElectroLynx Harness (Frame)	QC-C1500P		MK	087100
1	Position Switch	DPS (DPDT)			087100
1	Power Supply	AQD (Size as required)		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: Operation:
• Door normally closed and secure.
• Access by valid credential presentation releasing the exit trim lever to allow authorized entry

and then relocking.
• Egress always free for immediate exit. Request-to-Exit sensor integrated into exit device push bar allows exit without alarm condition.
• Door position switches provide open/closed monitoring to both access control system and intrusion alarm service.
• Exit trim lever remains locked (fail secure) in event of power loss. Key override cylinder for emergency access.

Set: 5.0

Doors: 139C

4	Hinge, Full Mortise, Hvy Wt	T4A3386 (NRP and Size as Required)	US32D	MK	087100
2	Hinge, Full Mortise, Hvy Wt (PWR TRNS)	T4A3386 QCx (# of Wires and Size as Required)	US32D	MK	087100
1	CVR Exit Device (EL Trim-Fail Sec., RX, CD)	ED5800 N9905ET M110 M92 M52 CTxSD (Cyl. Dogging)	630	RU	087100
1	CVR Exit Device (EO, RX, CD)	ED5800 EO M110 M92 M52 (Cyl. Dogging)	630	RU	087100
2	SFIC Cylinder Housing	Size and Cam as required	626	BE	087100
3	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
2	Surface Closer	DC8210 A11 (HD PA SPG STP Arm)	689	RU	087100
2	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Gasketing	303AS (Head & Jambs)		PE	087100
1	Rain Guard	346C x Width of Frame Head		PE	087100
2	Sweep	3452CNB x Length Required		PE	087100
1	Threshold	273x224AFGT x Length Required x MSES25SS		PE	087100
1	Card Reader	By Security Supplier			
2	ElectroLynx Harness (Door)	QC-C**** x Length Required		MK	087100
2	ElectroLynx Harness (Frame)	QC-C1500P		MK	087100
2	Position Switch	DPS (DPDT)			087100
1	Power Supply	AQD (Size as required)		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: Operation:
• Doors normally closed and secure.
• Access by valid credential presentation releasing the exit trim lever at the active leaf to allow authorized entry and then relocking.

• Egress always free for immediate exit at either door. Request-to-Exit sensor integrated into exit device push bars allows exit without alarm condition.
• Door position switches provide open/closed monitoring to both access control system and intrusion alarm service.
• Exit trim lever remains locked (fail secure) in event of power loss. Key override cylinder for emergency access.

Set: 6.0

Doors: 101B

1	Continuous Hinge	DFM_SLF-HD1 PT x Length Required		PE	087100
1	Electric Power Transfer	EL-CEPT	613E	SU	087100
1	Narrow Rim Exit Device (NL, RX, ELR, CD)	ED4200S K157ET M110 M92 MELR M52 CTxSD	630	RU	087100
1	SFIC Cylinder Housing	Size and Cam as required	626	BE	087100
2	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
1	Door Pull	RM3331-36 Mtg-Type 12XHD	US32D	RO	087100
1	Automatic Opener	6310 / 6330 (As Required)	689	NO	087100
1	ElectroLynx Harness (Door)	QC-C**** x Length Required		MK	087100
1	ElectroLynx Harness (Frame)	QC-C1500P		MK	087100
1	Auto Actuator Switch	505		NO	087100
1	Position Switch	DPS (DPDT)			087100
1	Power Supply	AQD (Size as required)		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: Operation:
• Door is normally closed and secure.
• An authorized card read on the pull side will release the exit device latch and activate the pull side auto operator actuator to allow authorized manual or auto operator access, then relock.
• Auto operator egress is allowed at all times by pressing the auto operator actuator in the lobby.
• Manual egress is allowed at all times by pressing the exit device push bar. Request to exit switch in the exit device push bar will signal an authorized egress to the access control system.
• Door position switch provides open/closed monitoring to both access control system and intrusion alarm service.
• The exit device latch will be released in the event of a power outage or emergency alarm, (Fail Secure).

Set: 7.0

Doors: 108B

1	Continuous Hinge	DFM_SLF-HD1 x Length Required		PE	087100
1	Continuous Hinge	DFM_SLF-HD1 PT x Length Required		PE	087100
1	Electric Power Transfer	EL-CEPT	613E	SU	087100
1	Narrow CVR Exit Device (PASS, ELR, Less Dogging)	ED4800 N810ET M110 MELR M51	630	RU	087100
1	Narrow CVR Exit Device (PASS, Less Dogging)	ED4800 N810ET M110 M51	630	RU	087100
1	Surface Closer	DC8200 / DC8210 (RA or PA Arm Mount as Required)	689	RU	087100
1	Drop Plate	754F25	689	RU	087100
1	Automatic Opener	6310 / 6330 (As Required)	689	NO	087100
2	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
1	ElectroLynx Harness (Door)	QC-C**** x Length Required		MK	087100
1	ElectroLynx Harness (Frame)	QC-C1500P		MK	087100
2	Auto Actuator Switch	505		NO	087100
1	Power Supply	AQD (Size as required)		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: Perimeter and meeting stile gasket by door / frame manufacturer.

Operation:
• Doors normally closed and latched. Exit Devices are Passage function with no locking.
• When the auto operator actuator on either side of the opening is pressed the exit device latch at the active leaf will release and the auto operator will open the door.
• Manual entry or egress, by turning exit trim lever or pushing the exit device push bar at either door.
• Exit Latch remains projected (fail secure) in event of power loss.

Set: 8.0

Doors: 139A

4	Hinge, Full Mortise, Hvy Wt	T4A3386 (NRP and Size as Required)	US32D	MK	087100
2	Hinge, Full Mortise, Hvy Wt (PWR TRNS)	T4A3386 QCx (# of Wires and Size as Required)	US32D	MK	087100
1	CVR Exit Device (EL Trim-Fail Sec., RX, CD)	ED5800 N9905ET M110 M92 M52 CTxSD (Cyl. Dogging)	630	RU	087100
1	CVR Exit Device (EO, RX, CD)	ED5800 EO M110 M92 M52 (Cyl. Dogging)	630	RU	087100

2	SFIC Cylinder Housing	Size and Cam as required	626	BE	087100
3	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
2	Surface Closer	DC8200 / DC8210 (RA or PA Arm Mount as Required)	689	RU	087100
2	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
2	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
2	Silencer	608		RO	087100
1	Card Reader	By Security Supplier			
2	ElectroLynx Harness (Door)	QC-C**** x Length Required		MK	087100
2	ElectroLynx Harness (Frame)	QC-C1500P		MK	087100
2	Position Switch	DPS (DPDT)			087100
1	Power Supply	AQD (Size as required)		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: Operation:
• Doors normally closed and secure.
• Access by valid credential presentation releasing the exit trim lever at the active leaf to allow authorized entry and then relocking.
• Egress always free for immediate exit at either door. Request-to-Exit sensor integrated into exit device push bars allows exit without alarm condition.
• Door position switches provide open/closed monitoring to both access control system and intrusion alarm service.
• Exit trim lever remains locked (fail secure) in event of power loss. Key override cylinder for emergency access.

Set: 9.0

Doors: 108A

6	Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP and Size as Required)	US26D	MK	087100
2	Hinge, Full Mortise, Hvy Wt (PWR TRNS)	T4A3786 QCx (# of Wires and Size as Required)	US26D	MK	087100
1	Keyed Removable Mullion	CR908BKM (Size as Required) M95 M57 CTxSD		RU	087100
1	Rim Exit Device (EL Trim-Fail Sec., RX, CD)	ED5200S N9905ET M110 M92 M52 CTxSD (Cyl. Dogging)	630	RU	087100
1	Rim Exit Device (EO, RX, CD)	ED5200S EO M110 M92 M52 (Cyl. Dogging)	630	RU	087100
3	SFIC Cylinder Housing	Size and Cam as required	626	BE	087100
4	SFIC Core	Small Format Interchangeable	626		087100

		Core-Keyed to Match the Existing Key System			
1	Conc Overhead Stop	1ADJ-X36	630	RF	087100
2	Surface Closer	DC8200 / DC8210 (RA or PA Arm Mount as Required)	689	RU	087100
2	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
1	Mullion Gasket	5110BL x Mullion Height		PE	087100
2	Silencer	608		RO	087100
1	Card Reader	By Security Supplier			
2	ElectroLynx Harness (Door)	QC-C**** x Length Required		MK	087100
2	ElectroLynx Harness (Frame)	QC-C1500P		MK	087100
2	Position Switch	DPS (DPDT)			087100
1	Power Supply	AQD (Size as required)		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: Operation:
• Doors normally closed and secure.
• Access by valid credential presentation releasing the exit trim lever at the active leaf to allow authorized entry and then relocking.
• Egress always free for immediate exit at either door. Request-to-Exit sensor integrated into exit device push bars allows exit without alarm condition.
• Door position switches provide open/closed monitoring to both access control system and intrusion alarm service.
• Exit trim lever remains locked (fail secure) in event of power loss. Key override cylinder for emergency access.

Set: 10.0

Doors: 139B

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP and Size as Required)	US26D	MK	087100
1	Fire Rated Rim Exit Device (STRM)	ED5200SA N959ET M110 CTxSD	630	RU	087100
1	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
1	Surface Closer	DC8200 / DC8210 (RA or PA Arm Mount as Required)	689	RU	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
1	Gasketing	S88D (Head & Jambs)		PE	087100

Set: 11.0

Doors: 106

2	Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP and Size as Required)	US26D	MK	087100
1	Hinge, Full Mortise, Hvy Wt (PWR TRNS)	T4A3786 QCx (# of Wires and Size as Required)	US26D	MK	087100
1	Electrified Mortised Lock (STRM, Fail Sec., RX)	ML20906-SEC NSB M92xM105 CTxSD	630	RU	087100
1	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
1	Surface Closer	DC8200 / DC8210 (RA or PA Arm Mount as Required)	689	RU	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
3	Silencer	608		RO	087100
1	Card Reader	By Security Supplier			
1	ElectroLynx Harness (Door)	QC-C**** x Length Required		MK	087100
1	ElectroLynx Harness (Frame)	QC-C1500P		MK	087100
1	Position Switch	DPS (DPDT)			087100
1	Power Supply	AQD (Size as required)		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: Operation:
• Door normally closed and secure.
• Access by valid credential presentation unlocking lever trim for a pre-determined time limit and then relocking.
• Egress always free for immediate exit. Request-to-Exit sensor integrated into lockset allows exit without alarm condition.
• Outside lever trim remains locked (fail secure) in event of power loss. Key override cylinder for emergency access.
• Door position switches provide open/closed monitoring to both access control system and intrusion alarm service.
• Lock performance and Cylinder monitoring capability integrated into the lockset if required.

Set: 12.0

Doors: 105A

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP and Size as Required)	US26D	MK	087100

3	Hinge, Full Mortise, Hvy Wt (PWR TRNS)	T4A3786 QCx (# of Wires and Size as Required)	US26D	MK	087100
1	Electrified Mortised Lock (STRM, Fail Sec., RX)	ML20906-SEC NSB M92xM105 CTxSD	630	RU	087100
1	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
1	Conc Overhead Stop	1ADJ-X36	630	RF	087100
1	Surface Closer	DC8200 / DC8210 (RA or PA Arm Mount as Required)	689	RU	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Gasketing	S88D (Head & Jambs)		PE	087100
1	Card Reader	By Security Supplier			
1	ElectroLynx Harness (Door)	QC-C**** x Length Required		MK	087100
1	ElectroLynx Harness (Frame)	QC-C1500P		MK	087100
1	Position Switch	DPS (DPDT)			087100
1	Power Supply	AQD (Size as required)		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: System Operational Narrative:
• Door normally closed and secure.
• Access by valid credential presentation and correct digital code entered into the keypad, unlocking lever trim for a pre-determined time limit and then relocking.
• Egress always free for immediate exit. Request-to-Exit sensor integrated into lockset allows exit without alarm condition.
• Outside lever trim remains locked (fail secure) in event of power loss. Key override cylinder for emergency access.
• Door position switches provide open/closed monitoring to both access control system and intrusion alarm service.
• Lock performance and Cylinder monitoring capability integrated into the lockset if required.

Set: 13.0

Doors: 102A, 111, 122, 126, 127, 129, 131, 140, A129, A130

3	Hinge, Full Mortise	TA2714 (NRP and Size as Required)	US26D	MK	087100
1	Storeroom Lock	ML2057 NSB CTxSD	630	RU	087100
1	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
1	Surface Closer	DC8200 / DC8210 (RA or PA Arm Mount as Required)	689	RU	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100

1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
3	Silencer	608		RO	087100

Notes: D125 and D126 to open to 180 degrees

Set: 14.0

Doors: 108D, 151B, 151C

1	Continuous Hinge	CFM_HD1 x Length Required		PE	087100
1	Mortised Deadbolt	DL4122 CTxSD	626	RU	087100
1	Flush Pull	94C	US32D	RO	087100

Set: 15.0

Doors: 112, 114, 115

3	Hinge, Full Mortise	TA2714 (NRP and Size as Required)	US26D	MK	087100
1	Office/Entrance Lock	ML2054 NSB CTxSD	630	RU	087100
1	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
1	Silencer	608		RO	087100

Set: 16.0

Doors: 107, 118, 124, 125A, 141, A121

3	Hinge, Full Mortise	TA2714 (NRP and Size as Required)	US26D	MK	087100
1	Office/Entrance Lock	ML2054 NSB CTxSD	630	RU	087100
1	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
1	Surface Closer	DC8200 / DC8210 (RA or PA Arm Mount as Required)	689	RU	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
1	Silencer	608		RO	087100

Set: 17.0

Doors: 128

4	Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP and Size as Required)	US26D	MK	087100
1	Office/Entrance Lock	ML2054 NSB CTxSD	630	RU	087100
1	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
1	Surface Closer	DC8200 / DC8210 (RA or PA Arm Mount as Required)	689	RU	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
3	Silencer	608		RO	087100

Set: 18.0

Doors: 105C

3	Hinge, Full Mortise	TA2714 (NRP and Size as Required)	US26D	MK	087100
1	Office/Entrance Lock	ML2054 NSB CTxSD	630	RU	087100
1	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
1	Surface Closer	DC8200 / DC8210 (RA or PA Arm Mount as Required)	689	RU	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
1	Gasketing	S88D (Head & Jambs)		PE	087100

Set: 19.0

Doors: 109, 123, 138

3	Hinge, Full Mortise	TA2714 (NRP and Size as Required)	US26D	MK	087100
1	Classroom Lock	ML2055 NSB CTxSD	626	RU	087100
1	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing	626		087100

		Key System			
1	Surface Closer	DC8200 / DC8210 (RA or PA Arm Mount as Required)	689	RU	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
1	Silencer	608		RO	087100

Set: 20.0

Doors: 116, 133, 135, 136, 137

3	Hinge, Full Mortise	TA2714 (NRP and Size as Required)	US26D	MK	087100
1	Privacy Lock (w/OCC IND)	ML2020 NSB V21	630	RU	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
1	Silencer	608		RO	087100
1	Coat Hook	RM801	US26D	RO	087100

Set: 21.0

Doors: 103, 104, 121

3	Hinge, Full Mortise	TA2714 (NRP and Size as Required)	US26D	MK	087100
1	Privacy Lock (w/OCC IND)	ML2020 NSB V21	630	RU	087100
1	Surface Closer	DC8200 / DC8210 (RA or PA Arm Mount as Required)	689	RU	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
3	Silencer	608		RO	087100
1	Coat Hook	RM801	US26D	RO	087100

Set: 22.0

Doors: 113, 114A, 117, A119

3	Hinge, Full Mortise	TA2714 (NRP and Size as Required)	US26D	MK	087100
1	Passage Latch	ML2010 NSB	630	RU	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100

3	Silencer	608		RO	087100

Set: 23.0

Doors: 132, 134

3	Hinge, Full Mortise	TA2714 (NRP and Size as Required)	US26D	MK	087100
1	Passage Latch	ML2010 NSB	630	RU	087100
1	Surface Closer	DC8200 / DC8210 (RA or PA Arm Mount as Required)	689	RU	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
3	Silencer	608		RO	087100

Set: 24.0

Doors: 105B

3	Hinge, Full Mortise	TA2714 (NRP and Size as Required)	US26D	MK	087100
1	Passage Latch	ML2010 NSB	630	RU	087100
1	Conc Overhead Stop	1ADJ-X36	630	RF	087100
1	Surface Closer	DC8200 / DC8210 (RA or PA Arm Mount as Required)	689	RU	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Gasketing	S88D (Head & Jambs)		PE	087100

Set: 25.0

Doors: 142, 156A, 156B

1	SFIC Cylinder Housing	Size and Cam as required	626	BE	087100
1	SFIC Core	Small Format Interchangeable Core-Keyed to Match the Existing Key System	626		087100
1		All Hardware Provided By Door Supplier			

Set: 26.0

Doors: 108C, 142A, 142B, 143, 144, 145, 146, 147, 148, 149A, 149B, 151A, 152, 153, 154, 155, 156C, 157A, 157B

1	Hardware by Detention Supplier	Hardware by Detention Supplier		OT	

Set: 27.0

Doors: MISC

1	Repair Kit	QC-R001	MK 087100
1	Crimp Tool	QC-R003	MK 087100
1	Test Unit	WT2	SA 087100

END OF SECTION 087100

SECTION 08 71 13 - AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of door operators:

1. Power units for swing doors, designed for wet or moist locations area locations, including actuator and controls equipment.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 08 41 13 – “Aluminum Framed Entrance and Storefront” for integral interior vestibule doors are linked and controlled.
2. Section 08 71 00- “Door Hardware” for technical and performance coordination with hardware groups and installation requirements for coordination.
3. Electrical connections and specified in Division 26 – “ELECTRICAL”.
4. Actuation controls coordination with Division 28 - “ELECTRONIC SAFETY AND SECURITY” technical requirements.

1.3 COORDINATION

A. Coordinate sizes and locations of recesses in concrete surfaces for recessed control components and wiring that control automatic door operators. Concrete, reinforcement, and formwork requirements are specified elsewhere.

B. Templates: Distribute for doors, frames, and other work specified to be factory prepared and reinforced for installing automatic door operators.

C. Coordinate hardware for doors with operators to ensure proper size, thickness, hand, function, and finish.

D. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to power supplies and access-control system.

1.4 SUBMITTALS

A. Product data for each door operator type required, including the manufacturer's standard details and fabrication methods and general published recommendations for each component of the door operating systems required, and the following:

1. Roughing-in diagrams.
2. Certified performance reports.
3. Installation instructions.
4. Parts lists.

B. Wiring diagrams detailing wiring for power operator, signal, and control systems. Clearly differentiate between manufacturer-installed wiring and field-installed wiring.

C. Maintenance Data: Submit manufacturer's maintenance and service data for door operators and control system including the name, address, and telephone number of the nearest authorized service representative.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who is an authorized representative of the manufacturer for the installation and maintenance of the type of units required for this Project.

B. Manufacturer's Qualifications: Provide door operators produced by a firm experienced in manufacturing operators that are similar to those indicated for this Project and that have a record of successful in-service performance.

C. Fire-Rated and Emergency Exit Openings: Provide door operators that comply with NFPA 80 requirements for doors as emergency exits, and do not interfere with fire ratings.

D. BHMA Standard: Provide power door operators that comply with applicable requirements of ANSI A156.19 2002 Power Assist and Low Energy Power Operated Doors, Power Operated Pedestrian Door Standard.

E. UL Standard: Provide power door operators that comply with UL 325.

1.6 WARRANTY

A. Warranty: Submit a written warranty, executed by the manufacturer, agreeing to repair or replace components of the power door operator system that fail in

materials or workmanship within the specified warranty period. Failures include, but are not necessarily limited to:

1. Faulty operation of operators and controls.
2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

B. Warranty Period: 3 years after the date of Project Substantial Completion.

1. The warranty shall not deprive the Owner of other rights or remedies that the Owner may have under other provisions of the Contract Documents and is in addition to, and runs concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL DOOR OPERATOR REQUIREMENTS

A. Capacity: Provide operators of the size recommended by the manufacturer for the door size, weight, and movement, for condition of exposure, and for long-term, maintenance- free operation under normal traffic load for the type of occupancy indicated.

B. Hinge Operation: For swing type doors, refer to Division 8 Section 08 71 00 - "Door Hardware" to determine type of hinge action to be matched by the door operator action.

C. Exposed Housing: Minimum 0.062-inch-thick extruded or formed aluminum cover with provisions for maintenance access. Provide fasteners that are concealed when door is in the closed position. Finish to match doors and frames.

D. Adjustment Features: Operators shall be fully adjustable. Provide adjustment for opening, closing, and checking speeds, as well as length of time the door remains open.

2.2 SWINGING AUTOMATIC DOOR OPERATORS

A. Basis of Design Power Assist Closers: Provide low energy power assist closers, Standard: BHMA A156.19. by the following manufacturers:

1. “Entrematic”, Ditec (Entrematic USA Inc.) low energy operator Model HA7.
2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

B. Exposed Housing for Operators: Aluminum with provisions for maintenance access. Provide fasteners that are concealed when door is in the closed position. Finish to match frames. Housing to extended across head of both doors when in pairs.

C. Electro-Mechanical Operator for Swinging Doors: Provide the manufacturer's standard electro-mechanical unit with doors power-opened and spring-closed, with the closing speed controlled mechanically by gear train and dynamically by braking action of electric motor and, with easy manual operation including spring closing with power off. Provide operator action as indicated and mounting as indicated below:

1. Operator Mounting Type: Surface-mounted overhead operator.
2. Automatic swing door operator comply with ANSI A156.19.
3. Fire Door Accessories: Provide fire door accessory package consisting of UL- listed latch mechanism power reset box, and caution labels for fire-resistance rated doors indicated for electro-mechanical operation.

D. Aluminum Finish: Class I, color anodic finish. AAMA 611, AA-M12C22A44, Class I, 0.018 mm or thicker.
1. Color as selected by the Architect from the manufacturer’s full range of current colors and finishes.

2.3 OPERATOR CONTROL SYSTEMS

A. Wall Activation Switches: Manufacturer's low-profile design, 4-1/2” round or square, wall-mounted activation plate, hard-wired push-plate switch on entry and exit side of each active door equipped with door operator, with color text and wheelchair logo.

1. Manufacturers: Provide products by one of the following.
   a. Norton Door Controls, 3000 Andrew Jackson Hwy., Monroe, NC 28112, www.nortondoorcontrols.com.
   b. Detex Corporation, 302 Detex Drive, New Braunfels, TX 78130 www.detex.com.
   c. MS SEDCO, 7898 Zionsville Road, Indianapolis, IN 46268, www. mssedco.com.
   d. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2. Wall Mounted Switch: Manufacturer's standard flush hard- wired wall-mounted door control switch plate, with No. 4 satin finish stainless steel push plate, intended for operation by touch. Provide plates with wheelchair logo. Surface wire raceway or wireless Push-Plates are not acceptable.

3. Operation: Where doors are operated by means of activation plates, provide activation plates on both side of each door equipped with door operator.

B. Presence Detection Safety Sensor: Provide an overhead presence sensor system for safety function to detect moving or stationary people in the swing path of the door(s). System requiring exposed wire loops shall not be permitted.

C. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.4 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extrusions: ASTM B221 (ASTM B221M).
2. Sheet: ASTM B209 (ASTM B209M).

B. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304 stretcher-leveled standard of flatness, in manufacturer's standard thickness.

C. Fasteners and Accessories: Corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

2.5 FABRICATION

A. Factory fabricate power door operators to comply with indicated standards.

B. Form aluminum shapes before finishing.

C. Fabricate exterior components to drain condensation and water-passing joints within operator enclosure to the exterior.

D. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match operator.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary, protective covering before shipping.

B. Apply anodic finishes to formed metal after fabrication unless otherwise indicated.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 PREPARATION AND EXAMINATION

A. Templates and Diagrams: Furnish templates, diagrams, and other data to fabricators and installers of related work, as necessary, for coordination of the power door operator installation.

B. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, and other conditions affecting performance of power door operators.

C. Examine roughing-in for electrical systems to verify actual locations of power connections before power door operator installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install power door operators in accordance with manufacturer's written instructions and cited BHMA standard for type of door operation and direction of pedestrian travel, including signage, controls, wiring, remote power units if any, and connection to building's power supply.

B. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion.

C. Install operators true in alignment with established lines and door geometry without warp or rack. Anchor securely in place.

D. Controls: Install activation and safety devices in accordance with manufacturer's written instructions and cited BHMA standard for operator type and direction of pedestrian travel. Connect control wiring in accordance with Division 26 Section "Wire and Cable."

E. Install complete power door operator system in accordance with manufacturer's instructions, including controls, control wiring, and remote power units.

1. Refer to Divisions 26 and 28 Sections for power connection specifications.

F. Set header assemblies, operating brackets, rails, and guides level and true to location with adequate anchorage for permanent support.

3.3 ADJUSTING

A. After repeated operation of completed installation equivalent to 3 days use by normal traffic (100 to 300 cycles), readjust door operators and controls for optimum operating condition and safety. Lubricate hardware, operating equipment, and other moving parts.

B. Adjust power door operators to function smoothly and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.

C. Adjust operators on exterior doors for tight closure.

D. After completing installation of power door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.

E. Readjust power door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

F. Occupancy Adjustment: When requested within 12 (twelve) months of date of Project Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two (2) visits to Project during other-than-normal occupancy hours for this purpose.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain power door operators.

3.5 AUTOMATIC DOOR OPERATOR SCHEDULE

A. Install Automatic Door Operators and Wall Mounted Operation Switches at the following locations:

1. Door 101A, one leaf and two wall mounted operation switches.

END OF SECTION 08 71 13

SECTION 08 71 63 - DETENTION DOOR HARDWARE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes all detention door hardware for:

1. Swinging detention doors.
2. Sliding detention doors.
3. Security access panels.
4. Security roof hatches.
5. Key cabinets.
6. As required by the contract documents.

B. Related sections:

1. 08 31 13.53 – Security Access Doors and Frames
2. 08 34 63 – Detention Hollow Metal Doors and Frames
3. 08 56 53 – Security Windows
4. 08 88 53 – Security Glazing
5. 28 46 19 – Electronic Security System

1.03 COORDINATION

A. Templates: Upon approval of submittals for detention doors, frames, and hardware, distribute detention hardware templates to related trades for the purpose of manufacturing doors and frames.

B. Wiring Diagrams: Coordinate layout and rough-in for electrified hardware with connections to power supplies, security system and fire alarm system.

1.04 PREINSTALLATION MEETINGS

A. Submittal Review: Prior to the approval of the Detention Hardware submittal package, meet with Owner, Architect, Contractor, and any related trades to perform a door-by-door review of the contract documents. Confirm that the submitted material meets the design intent, opening handing and required building functionality per the contract documents.

B. Detention Keying Conference: Prior to ordering locks from the factory, perform a key conference in the presence of the Owner, Architect and Contractor to determine the facility keying requirements. Confirm address for the delivery of permanent keys.

C. Preinstallation Conference: Discuss and inspect materials provided and installed by other trades. Confirm that rough-ins are properly located. Confirm that doors and frames are properly prepared to receive approved detention hardware.

1.05 SUBMITTALS

A. Detention Door Hardware Schedule: Submit a Detention Door Hardware Schedule in DHI vertical format Prepared by or under the supervision of a specialist in detailing detention hardware for detention doors and frames. Coordinate the Detention Door Hardware Schedule with detention doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of detention door hardware.

B. Manufacturer Product Data: Provide catalog cuts for review. Provide details for material, finishes, electrical data, certifications, optional features, and any other information required to ensure compliance to the contract documents.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Detention hardware shall be installed by Union Ironworker Mechanics, skilled in the application of hardware and in accordance with the recommendations of the appropriate manufacturer. All included instruction sheets and installation details shall be read and understood before any attempt is made to install the hardware.

B. Supplier Qualifications: Detention door hardware supplier with warehousing facilities in Project's vicinity who is, or employs, a qualified DHI Door Security and Safety Professional or a Detention Hardware Scheduler with a minimum of ten (10) years experience who is available during the course of the Work to consult with Contractor, Architect, Owner and Installers about detention door hardware and keying.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Order material immediately upon receipt of approved submittals and keying so as to avoid delays in delivery of material to the Project site.

B. Inventory detention door hardware on receipt and provide secure lockup for detention door hardware delivered to Project site.

C. Tag each item or package separately with identification related to the Detention Door Hardware Schedule and include basic installation instructions with each item or package.

D. Deliver detention door keys to Owner by registered mail or overnight package service.

1.08 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of detention door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.

b. Faulty operation of electrical and/or mechanical components.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering or detention use.

2. Warranty Period: One (1) year from date of Substantial Completion.

3. Warranty Period for Security Door Closers: Ten (10) years from date of Substantial Completion.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide products listed in the Detention Hardware Schedule in sufficient quantities to complete the Project
requirements.

1.	Hinges:	Specified – Willoughby Industries	(WI)
		Acceptable – Northwest Specialty Hardware	(NW)
2.	Locksets:	Specified – RR Brink	(BR)
		Acceptable – Approved equal	
3.	Concealed Door Closers:	Specified – LCN	(LC)
		Acceptable – Approved equal	
4.	Door Pulls:	Specified – Willoughby Industries	(WI)
		Acceptable – Northwest Specialty Hardware	(NW)
5.	Thresholds and Gasket:	Specified – National Guard Products	(NG)
		Acceptable – Approved equal	
6.	Wall Stops:	Specified – Pauly Jail Building Company	(PJ)
		Acceptable – Northwest Specialty Hardware	(NW)
7.	Switches:	Specified – RR Brink	(BR)
		Acceptable – Approved equal	

2.02 – FINISHES

A. Unless noted in the hardware groups, finished are to be furnished as follows:

1.	Hinges	Stainless Steel	630/US32D
2.	Mogul Cylinders	Brushed Chrome	626/US26D
3.	Closers	Painted Aluminum	689
4.	Pulls	Stainless Steel	630/US32D
5.	Thresholds/Rigid Gasket	Anodized Aluminum	628
6.	Self-Adhesive Gasket	Charcoal	
7.	Floor/Wall Stops	Black	

2.03 – DETENTION HINGES

A. Type: Door Hinges – Basis of design: WSH4545K

1. Full mortise with hospital tip and security studs.
2. Material: Investment cast stainless steel.
3. Size: 4-1/2” x 4-1/2” x 3/16” thick.
4. Pin: Stainless Steel; Concealed & Non-Removable; cross-pinned after assembly to make disassembly impossible.
5. Bearings: Self-lubricating, engineered thermo-plastic, flange type design to support thrust and radial loads.
6. Capacity: 300lb Door (3 Hinges).
7. Quantity: 3 each up to 3’0” x 7’4”; Furnish one additional hinge for openings over 7'-4" high and for each additional 2'-6" of opening height and for openings over 3'-0" wide.
8. Fasteners: ¼-20 x ½” #30 Torx head.
9. Certification: ANSI/BHMA A156.7 and ASTM F1758-03 Grade 1 criteria.

B. Type: Food Pass/Cuff Port Hinges – Basis of design NW 631FPB

1. Material: Formed Steel Plate.
2. Size: 3” x 4” x 1/4” thick.
3. Pin: Fully welded and ground to appear solid.
4. Bearings: Plain bearing.
5. Fasteners: Security Flat Hd, 3/8-16 x 3/4".

2.04 – LOCKS AND KEYING

A. Electromechanical Operation – Basis of design: 5020M Series

1. 10-gauge steel lock case and cover, electroplated for corrosion resistance. All internal parts to be cast, fabricated, or turned stainless steel.
2. Fitted for mechanical operation via either RRBLS proprietary “Mogul” or user’s commercial key cylinder.
3. Provide locks that are compatible with a stop (push) side cylinder access pocket. Key cylinder extensions (KCE) are not acceptable.
4. UL Listed to 3 hours per UL10B.
5. Internal lock status switch (LSS) monitors status of bolt. Provide model number 201020 door position switch (DPS) to ensure positive, tamper resistant signaling of a closed and dead-locked door.
6. Provide locks with Maintained Latch Holdback (MSLH) function.
7. Exposed fasteners: Pinned “Torx” head.
8. Certification: ASTM F1577 Grade 1 criteria.

B. Mechanical Food Pass/Cuff Port Lock – Basis of design: 7017M Series

1. Investment cast steel lock case, zinc plated.
2. Stainless steel latch.
3. Latch size: 1-1/2” x 3/4”

C. Mechanical Automatic Deadlatch – Basis of design: 7070M Series

1. Investment cast steel lock case, zinc plated.
2. Zinc plated steel deadlatch with two hardened steel inserts.
3. Latch throw: 3/4”.
4. Latch size: 2” x 3/4”.
5. Provide 1-way escutcheon.
6. Provide bolt keeper with dust box (7010KD) standard; 7010KS at monitored locations.
7. Provide locks for Hollow Metal Mounting (specify FHM).
8. UL Listed to 3 hours per UL10B.

D. Mechanical Automatic Deadlatch – Basis of design: 7080M Series

1. Investment cast steel lock case, zinc plated.
2. Stainless steel deadbolt with three hardened steel inserts.
3. Latch throw: 3/4”.
4. Latch size: 2” x 3/4”.
5. Provide 1-way escutcheon.
6. Provide bolt keeper with dust box (7010KD) standard; 7010KS at monitored locations.
7. Provide locks for Hollow Metal Mounting (specify FHM).
8. Certification: ASTM F1577 and F1450 Grade 1 criteria.

E. KEYS AND KEYING

1. The DEC will meet with the Architect and Owner to review the keying schedule and systems layout. All locks are to be keyed as directed as a result of this meeting.
2. Mogul type cylinder shall be keyed in sets and master keyed to level as directed.
    a. Provide five (5) keys per key alike set.
    b. Provide five (5) keys per master level.
3. Paracentric type cylinder shall be keyed alike in sets, no master key.
    a. Provide five (5) keys per key alike set.
4. All keys shall be stamped with a number or letter combination as directed.

2.04 – DOOR CLOSERS – Basis of design: LCN 2210 Series

1. Vandal resistant design for concealed mounting.
2. Handed for right or left swinging doors.
3. Closers to meet ADA reduced opening force requirements.
4. All closers furnished with Torx tamper resistant machine screws.
5. Full rack and pinion hydraulic action.
6. UL certified for three hours in compliance with UL10C.
7. 15-year warranty.

2.05 – DOOR POSITION SWITCHES – Basis of design: 201020 Series

1. Furnish magnetic concealed door position switches. Switch is single pole double throw type with rating of .5 amps at 24V maximum.

2.06 – MISCELLANEOUS HARDWARE

1. Combo Pull: As specified in the hardware sets: WDP0108K
2. Loop Pull: As specified in the hardware sets: WPP0310K

3. Provide silencers in metal door frames, unless not permitted for fire rating, or unless bumper-type weatherstripping is provided; three per single door frame, two per double door frame. All exterior doors shall have bumper type weatherstripping.
4. Threshold and weather seal: As specified in hardware sets.

PART 3 – EXECUTION

3.01 – EXAMINATION

1. Examine detention doors and frames, with installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
2. Examine rough-in for embedded and built-in anchors to verify actual locations of detention door hardware connections before detention door hardware installation.
3. Inspect built-in and cast-in anchor installations, before installing detention door hardware, to verify that anchor installations comply with requirements. Prepare inspection reports.
4. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
5. Perform additional inspections to determine compliance of replaced or additional work.
6. Verify locations of detention door hardware with those indicated on shop drawings.
7. Examine rough-in for electrical power systems to verify actual locations of connections before detention door hardware installation.
8. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 – PREPARATION

1. Steel Detention Doors and Frames: Comply with BHMA A156.115 Series.
2. Surface-Applied Detention Door Hardware: Drill and tap detention doors and frames according to SDI A250.6.

3.03 – INSTALLATION

1. Mounting Heights: Mount detention door hardware units at heights indicated in DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
2. Install each detention door hardware item to comply with Shop Drawings and manufacturer's written instructions. Where cutting and fitting are required to install detention door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
3. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
4. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
5. Install interconnecting wiring and connectors between detention door hardware devices. Terminate device wiring for detention door hardware installed in swinging doors at a plug-type connector located in lock pocket or door frame junction box.
6. Security Fasteners: Install detention door hardware using security fasteners with head style appropriate for installation requirements, strength, and finish of adjacent materials.

3.04 – FIELD QUALITY CONTROL

1. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and/or deviations from the Contract Documents.
2. After installing electrically powered detention door hardware and after electrical circuitry has been energized, test detention door hardware for compliance with requirements:
    a. Operate lock of each door and group of doors in normal remote, normal local, and emergency operating modes.
    b. Verify that remote controls operate correct door locks and in correct sequence.
3. Verify that lock bolts engage strikes with required bolt projection.
4. Verify that detention door hardware is installed, connected, and adjusted according to the contract documents.
5. Verify that electrical wiring installation complies with manufacturer's submittal and written installation requirements.
6. Detention work will be considered defective if it does not pass tests and inspections.
7. Perform additional inspections to determine compliance of replaced or additional work.
8. Prepare field quality-control certification endorsed by detention specialist that states installed products comply with requirements in the contract documents.
9. Prepare test and inspection reports.

3.05 – ADJUSTING

1. Adjust and check each operating item of detention door hardware and each detention door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust detention door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
2. Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

3.06 – CLEANING AND PROTECTION

1. Clean adjacent surfaces soiled by detention door hardware installation.
2. Clean operating items as necessary to restore proper function and finish.
3. Provide final protection and maintain conditions that ensure that detention door hardware is without damage or deterioration at time of substantial completion.

3.07 – DETENTION DOOR HARDWARE SETS:

<u>Hardware Set S02.2 Masonry Cell - Slam Lock & FP</u>

Doors: 142B, 145, 149B, 152, 153, 154, 155

Each to receive:

3	EA	Hinge	WSH4545K 4.5" x 4.5" US32D	WI
2	EA	FP Hinge	NW631 FPB USP	NW
1	EA	Food Pass Lock	7017M	BR
1	EA	Slam Lock	7072M x FHM x 7070KD ESC (1-WAY) USP	BR
1	EA	Loop Pull	WDP0108K US32D	WI
1	EA	Flush Pull	Titan #2 (By door mfr.) USP	TN
1	EA	Wall Stop	WS-01 BLACK	PJ
3	EA	Silencer	SR64-GRY	IV

Hardware Set S04.1 Corridor/General Use

Doors: 108C, 142A, 149A, 151A

Each to receive:

3	EA	Hinge	WSH4545K 4.5" x 4.5" US32D	WI
1	EA	Elect Jamb Lock	5026M-MSLH 24VDC	BR
1	EA	Loop Pull	WDP0108K US32D	WI
1	EA	Combo Pull	WPP0310K US32D	WI
1	EA	Closer	2214 AL	LC
1	EA	Wall Stop	WS-01 BLACK	PJ
3	EA	Silencer	SR64-GRY	IV
1	EA	Magnetic DPS	201020 US32D	BR

Hardware Set S07.1 Storage/Janitor

Doors: 143, 144, 146, 147, 148, 157A

Each to receive:

3	EA	Hinge	WSH4545K 4.5" x 4.5" US32D	WI
1	EA	Deadbolt	7086M x FHM x 7080KD ESC (1-WAY) USP	BR
1	EA	Wall Stop	WS-01 BLACK	PJ
3	EA	Silencer	SR64-GRY	IV

Hardware Set S09.1 Exterior/Secure Perimeter

Doors: 156C

Each to receive:

3	EA	Hinge	WSH4545K 4.5" x 4.5" US32D	WI
1	EA	Elect Jamb Lock	5026M-MSLH 24VDC	BR
1	EA	Loop Pull	WDP0108K US32D	WI
1	EA	Combo Pull	WPP0310K US32D	WI
1	EA	Closer	2214 AL	LC
1	EA	Door Stop	FS18L	IV
1	EA	Threshold	896S 36" TORX #10 x 1-1/2" SMS x PA	NG
1	EA	Gasketing	161SA AL 36" x 84"	NG
1	EA	Magnetic DPS	201020 US32D	BR

END OF SECTION 08 71 63

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Glass for doors, interior borrowed lites and glazed storefront systems.
2. Glazing sealants and accessories.

B. Related Requirements:

1. Section 08 11 13 “Hollow Metal Doors and Frames”
2. Section 08 42 13 "Aluminum Framed Entrances."

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of the following products, 12-inches (300 mm) square.

1. Tinted glass.
2. Coated glass.
3. Insulating glass.
4. Spandrel glass.

C. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch (300-mm) lengths.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer manufacturers of insulating-glass units with sputter-coated, low-E coatings glass testing agency and sealant testing agency.

B. Product Certificates: For glass.

C. Product Test Reports: For tinted glass coated glass insulating glass and glazing sealants, for tests performed by a qualified testing agency.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Sample Warranties: For special warranties.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

1.12 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are

not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design glazing.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.

1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.

a. Wind Design Data: As indicated on Drawings.
b. Basic Wind Speed: 115 mph (51 m/s).
c. Importance Factor: 1.0.
d. Exposure Category: C.

2. Design Snow Loads: As indicated on Drawings.
3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

D. Windborne-Debris-Impact Resistance: Exterior glazing shall comply with basic protection testing requirements in ASTM E 1996 for Wind Zone 4 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on Project and shall be installed in same manner as glazing indicated for use on Project.

1. Large-Missile Test: For glazing located within 30 feet (9.1 m) of grade.
2. Small-Missile Test: For glazing located more than 30 feet (9.1 m) above grade.

E. Safety Glazing: Always provide safety glazing that complies with 16 CFR 1201, Category II if the glazing falls under these circumstances:
1. Glazing in windows:
   a. The exposed area of an individual pane is greater than 9 square feet
   b. The bottom edge of the blazing is less than 18” above the floor
   c. The top edge of the glazing is greater than 36” above the floor; and
   d. One or more walking surface(s) are within 36”, measured horizontally and in a straight line, of the plane of the glazing.
2. Glazing in doors:
   a. Glazing in ALL fixed and operable panels of swinging, sliding, and bifold doors shall be considered a hazardous location, which will in turn require safety glazing.
      1) Exceptions:
         a) Glazed openings of a size through which a 3-inch-diameter sphere is unable to pass.
         b) Decorative glazing.
         c) Glazing materials used as curved glazed panels in revolving doors.
         d) Commercial refrigerated cabinet glazed doors.
3. Glazing adjacent to doors:
   a. Glazing in an individual fixed or operable panel adjacent to a door where the nearest vertical edge of the glazing is within a 24-inch arc of either vertical edge of the door in a closed position and where the bottom exposed edge of the glazing is less than 60 inches above the walking surface shall be considered a hazardous location, which will in turn require safety glazing.
      1) Exceptions:
         a) Decorative glazing.
         b) Where there is an intervening wall or other permanent barrier between the door and glazing.

c) Where access through the door is to a closet or storage area 3’ or less in depth. Glazing in this application shall comply with Section 2406.4.3.
d) Glazing in walls on the latch side of and perpendicular to the plane ofd the door in a close potion in one- and two- family dwellings or within dwelling units in Group R-2

4. Glazing in multipurpose gymnasiums, basketball courts and similar athletic facilities subject to human impact loads shall comply with Category 2 of CPSC 16 CFR Part 1201 or Class A of ANSI Z97.1

F. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic glass lites, properties are based on units with lites of thickness indicated.
2. For laminated glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
   a. Minimum U-Factor:
      1) Metal w/ Thermal Break: Single (1.10), Double (0.65)
      2) Metal: Single (1.20), Double (0.80)
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
   a. Single Glazed Minimums:
      1) Tinted: SHGC (0.7), VT (0.3)
      2) Clear: SHGC (0.8), (0.6)
   b. Double Glazed Minimums:
      1) Tinted: SHGC (0.6), VT (0.3)
      2) Clear: SHGC (0.7), VT (0.6)

6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IgCC.

C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 1/4-inch.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

B. Silicone-Coated Spandrel Glass: ASTM C 1048, Type I, Condition C, Quality-Q3.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Spacer: Thermally broken aluminum.
3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.6 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Subject to compliance with requirements, provide products by one of the following.
   a. Pecora Corporation
   b. Sika Corporation
   c. Tremco Corporation

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; non-staining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.9 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior, or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 MONOLITHIC GLASS SCHEDULE

A. Glass Type GL-1: Clear fully tempered float glass.

1. Minimum Thickness: 6 mm.
2. Safety glazing required.

3.9 INSULATING GLASS SCHEDULE

A. Glass Type GL-2: Low-E-coated, tinted insulating glass.

1. Overall Unit Thickness: 1 inch (25 mm).
2. Minimum Thickness of Each Glass Lite: 6 mm.
3. Outdoor Lite: Tinted heat-strengthened float glass.
4. Tint Color: As selected by the Architect from manufacturer’s full range.

5. Interspace Content: Argon.
6. Indoor Lite: Clear fully tempered float glass.
7. Low-E Coating: Pyrolytic or sputtered on second or third surface.
8. Winter Nighttime U-Factor: 0.24 maximum.
9. Summer Daytime U-Factor: 0.20 maximum.
10. Visible Light Transmittance: 40 percent minimum.
11. Solar Heat Gain Coefficient: 0.21 maximum.
12. Safety glazing required.

END OF SECTION 08 80 00

SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following types of silvered flat glass mirrors:

1. Tempered glass mirrors qualifying as safety glazing.

B. Related Requirements:

1. Section 088000 "Glazing" for glass with reflective coatings used for vision and spandrel lites.
2. Section 102800 "Toilet, Bath, and Laundry Accessories" for metal-framed mirrors.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Avalon Glass and Mirror Company.
2. Binswanger Mirror; a division of Vitro America, Inc.
3. D & W Incorporated.
4. Donisi Mirror Company.
5. Gardner Glass, Inc.
6. Gilded Mirrors, Inc.
7. Glasswerks LA, Inc.
8. Guardian Industries Corp.; SunGuard.
9. Head West.
10. Independent Mirror Industries, Inc.
11. Lenoir Mirror Company.
12. National Glass Industries.
13. Stroupe Mirror Co., Inc.
14. Sunshine Mirror; Westshore Glass Corp.
15. Trulite Glass & Aluminum Solutions, LLC.
16. Virginia Mirror Company, Inc.
17. Walker Glass Co., Ltd.

B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.

C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

2.2 SILVERED FLAT GLASS MIRRORS

A. Mirrors, General: ASTM C 1503.

B. Tempered Glass Mirrors: Mirror Glazing Quality for blemish requirements and complying with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; clear.

1. Nominal Thickness: 4.0 mm.

C. Safety Glazing Products: For tempered mirrors, provide products that comply with 16 CFR 1201, Category II.

2.3 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

C. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

2.4 MIRROR HARDWARE

A. Plated Steel Hardware: Formed-steel shapes with plated finish indicated.

1. Profile: As indicated.

B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.5 FABRICATION

A. Fabricate mirrors in the shop to greatest extent possible.

B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

C. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint, as recommended in writing by film-backing manufacturer, to produce a surface free of bubbles, blisters, and other imperfections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

1. GANA Publications: "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

B. Provide a minimum airspace of 1/8 inch (3 mm) between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

3.4 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300

SECTION 088853 - SECURITY GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes laminated glass, laminated glass and polycarbonate, and insulating security glazing for the following applications:

1. Windows
2. Doors.
3. Interior borrowed lites.

1.3 DEFINITIONS

A. Glazing Manufacturers: Firms that produce primary glass, monolithic plastic glazing, or fabricated security glazing, as defined in referenced glazing publications.

B. Interspace: Space between lites of air-gap security glazing or insulating security glazing.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on security glazing, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for security glazing during and after installation.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Security Glazing Samples: For each type of security glazing; 12 inches (300 mm) square.

C. Security Glazing Schedule: List security glazing types and thicknesses for each size opening and location. Use same designations indicated on Drawings. Indicate coordinated dimensions of security glazing and construction that receives security glazing, including clearances and glazing channel dimensions.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of security glazing, for tests performed by a qualified testing agency.

B. Product Test Reports: For each type of glazing sealant, for tests performed by a qualified testing agency.

1. Provide test reports based on testing current sealant formulations within previous 36-month period.

C. Sample Warranties: For special warranties.

1.8 QUALITY ASSURANCE

A. Retain option in "Manufacturer Qualifications for Insulating Security Glazing Units with Sputter-Coated, Low-E Coatings" Paragraph below only if products listed in Part 2 for sputter-coated, low-e-coated, insulating glazing units are those of manufacturers with a certified fabricator program.

B. Manufacturer Qualifications for Insulating Security Glazing Units with Sputter-Coated, Low-E Coatings: A qualified insulating glazing manufacturer who is approved and certified by coated-glass manufacturer.

C. Installer Qualifications: A qualified installer who employs glazing installers for this Project who are certified under the National Glass Association Glazier Certification Program.

D. Security Glazing Testing Agency Qualifications: Subject to compliance with requirements, testing agency is one of the following:

1. H. P. White Laboratory, Inc.
2. Underwriters Laboratories, Inc.
3. Wiss, Janney, Elstner Associates, Inc.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect security glazing and glazing materials according to manufacturer's written instructions. Prevent damage from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating security glazing and with air-gap security glazing manufacturers' written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.11 WARRANTY

A. Manufacturer's Special Warranty for Coated Glass: Manufacturer agrees to replace coated glass that deteriorates within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer agrees to replace laminated glass that deteriorates within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Laminated Glass and Polycarbonate: Manufacturer agrees to replace laminated glass and polycarbonate that deteriorates within specified warranty period. Deterioration of laminated glass and polycarbonate is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass and polycarbonate contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by

referenced glass-clad polycarbonate standard, yellowing, and loss of light transmission.

1. Warranty Period: 10 years from date of Substantial Completion.

D. Manufacturer's Special Warranty on Insulating Security Glazing: Manufacturer agrees to replace insulating security glazing that deteriorates within specified warranty period. Deterioration of insulating security glazing is defined as defects in individual lites developed from normal use or failure of hermetic seal under normal use. Deterioration does not include defects in individual lites or failure of hermetic seal that is attributed to glass breakage or to maintaining and cleaning insulating security glazing contrary to manufacturer's written instructions.

1. Defects in coated-glass lites include peeling, cracking, and other indications of deterioration in coating.
2. Defects in laminated-glass lites include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
3. Defects in glass-clad polycarbonate lites include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced glass-clad polycarbonate standard, yellowing, and loss of light transmission.
4. Evidence of hermetic seal failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glazing.
5. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Security Glazing: Obtain security glazing from single source from single manufacturer using the same types of lites, plies, interlayers, and spacers for each security glazing type indicated.

1. Source Limitations for Tinted Glass: Obtain from single source from single primary glass manufacturer for each tint color indicated.

B. Source Limitations for Glazing Gaskets: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General:

1. Installed security glazing shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing; or other defects in construction.

2. Installed security glazing shall withstand security-related loads and forces without damage to the glazing beyond that allowed by referenced standards.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements" Section 01400 "Quality Requirements," to design security glazing.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated.

1. Design Procedure for Glass: ASTM E 1300 and ICC's International Building Code.
2. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.

a. Basic Wind Speed: 100 mph (44 m/s).
b. Importance Factor: 1..
c. Exposure Category: C.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glazing framing members and glazing components.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

2.3 SECURITY GLAZING, GENERAL

A. Glazing Publications: Comply with published recommendations of security glazing and glazing material manufacturers and organizations below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Plastic Glazing Labeling: Identify plastic sheets with appropriate markings of applicable testing and inspecting agency, indicating compliance with required fire-test-response characteristics.

C. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the Safety Glazing Certification Council. Label shall indicate manufacturer's name, type of glazing, glass thickness, and safety glazing standard with which glazing complies.

D. Insulating Glazing Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the Insulating Glass Certification Council.

E. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

F. Thermal and Optical Performance Properties: Provide security glazing with performance properties specified, as indicated in manufacturer's published test data, based on construction products indicated and on procedures indicated below:

1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
2. Solar-Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.4 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. For heat-strengthened float glass, comply with requirements for Kind HS.
3. For fully tempered float glass, comply with requirements for Kind FT.
4. For uncoated glass, comply with requirements for Condition A.

2.5 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
2. Interlayer Color: Clear unless otherwise indicated.

2.6 POLYCARBONATE SECURITY GLAZING

A. Glass-Clad Polycarbonate: ASTM C 1349.

B. Laminated Glass and Polycarbonate: ASTM C 1349.

2.7 INSULATING SECURITY GLAZING

A. Insulating Security Glazing: Factory-assembled units, consisting of sealed lites of glazing material indicated separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Spacer: Manufacturer's standard spacer material and construction.
3. Desiccant: Molecular sieve or silica gel, or blend of both.

2.8 SPALL-RESISTANT FILM

A. Spall-Resistant Film: Composite of clear polyvinyl butyral film and clear abrasion-resistant polyester film.

B. Laminating Process: Factory laminate spall-resistant film to glazing assemblies to produce laminated lites free of foreign substances, air, and glass pockets.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of security glazing and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by security glazing manufacturer to maintain security glazing lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit security glazing lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.10 FABRICATION OF SECURITY GLAZING

A. Fabricate security glazing in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing for security glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Minimum required bite.
5. Effective sealing between joints of framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving security glazing immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of security glazing, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect edges of security glazing from damage during handling and installation. Remove damaged security glazing from Project site and legally dispose of off Project site. Damaged security glazing includes units with edge or face damage or other imperfections that, when installed, could weaken security glazing and impair performance and appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glazing unit manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by security glazing manufacturers for installing lites.

F. Provide spacers for security glazing lites where the length plus width is larger than 50 inches (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of security glazing. Install correct size and spacing to preserve required face clearances unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glazing lites and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent security glazing from moving sideways in glazing channel, as recommended in writing by security glazing manufacturer and according to requirements in referenced glazing publications.

H. Set security glazing in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set coated security glazing with proper orientation so that coatings and films face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket securely in place between glazing unit and frame or fixed stop, so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center security glazing in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in security glazing. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center security glazing in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression

gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in security glazing. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect security glazing from contact with contaminating substances resulting from construction operations, including weld splatter. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with security glazing, remove substances immediately as recommended in writing by security glazing manufacturer. Remove and replace security glazing that cannot be cleaned without damage.

3.6 LAMINATED-GLASS SECURITY GLAZING SCHEDULE (Interior counter glazing)

A. Security Glazing Type SG-1: Clear laminated glass.

1. Basis of Design Products: Subject to compliance with requirements, provide one of the following:

a. Global Security Glazing

b. E-Plastics.

c. Glasswerk GT

d. Insulgard

e. Saf-Glas

f. SRG Glass

g. Dlubak Corporation

2. Ballistic Resistance: Level 5 according to UL 752.
3. Maximum Overall Unit Thickness: 1.307”.
4. Weight per sf: 14.64.
5. Core Ply: 5-mm float glass.
6. Inner Ply: 5-mm fully tempered float glass.
7. Interlayer Material: Polyvinyl butyral.
8. Interlayer Thickness: 0.090 inch (2.3 mm).
9. Provide safety glazing labeling.

B.

1. Basis of Design Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Global Security Glazing
   b. E-Plastics.
   c. Glasswerk GT
   d. Insulgard
   e. Saf-Glas
   f. SRG Glass
   g. Dlubak Corporation
2. Detention Security Grade: Grade 3 according to ASTM F 1915 warm-temperature impact test.
3. Ballistic Resistance: Level 8 according to UL 752.
4. Maximum Overall Unit Thickness: 1.307”.
5. Glass Tint Color: Clear.
6. Provide safety glazing labeling.

3.7 INSULATING SECURITY GLAZING SCHEDULE

A. Security Glazing Type SG-2: Low-e-coated, insulating security glazing. Outdoor lite is made of laminated glass and indoor lite is made of glass-clad polycarbonate with spall-resistant film on inside face.
   1. Basis of Design Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Global Security Glazing
      b. E-Plastics.
      c. Glasswerk GT
      d. Insulgard
      e. Saf-Glas
      f. SRG Glass
      g. Dlubak Corporation
   2. Detention Security Grade: Grade 3 according to ASTM F 1915 warm-temperature impact test.

3. Ballistic Resistance: Level 5 according to UL 752.
4. Overall Unit Thickness: 2.25”.

5. Interspace Content: Argon.
6. Interspace Dimension: 1/2” minimum.
7. Glass Tint Color: Clear.
8. Low-E Coating: Sputtered on third surface.
9. Overall Visible Light Transmittance: 74.5 percent minimum.
10. Winter Nighttime U-Factor: .814 maximum.
11. Solar-Heat-Gain Coefficient: .591 maximum.
12. Provide safety glazing labeling.

END OF SECTION 088853

SECTION 08 91 19 - FIXED LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fixed, extruded-aluminum louvers.

B. Related Requirements:

1. Section 07 92 00 "Sealants".

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

C. Vertical Louver: Louver with vertical blades (i.e., the axes of the blades are vertical).

D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
2. Wind Loads: Determine loads based on a uniform pressure of 20 lbf/sq. ft. (957 Pa), acting inward or outward.

B. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver.:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide. or comparable product by one of the following:

    a. Air Balance Inc.; a division of MESTEK, Inc.
    b. Air Flow Company, Inc.
    c. Airolite Company, LLC (The).
    d. All-Lite Architectural Products.
    e. American Warming and Ventilating; a Mestek Architectural Group company.
    f. Architectural Louvers; Harray, LLC.
    g. Arrow United Industries.
    h. Carnes Company.
    i. Cesco Products; a divsion of MESTEK, Inc.
    j. Construction Specialties, Inc.
    k. DAMS Incorporated; D. Architectural Metal Solutions Incorporated; Drainable Blade Louvers.
    l. Dowco Products Group.
    m. Greenheck Fan Corporation.
    n. Industrial Louvers Inc.
    o. Louvers & Dampers, Inc.; a division of Mestek, Inc.
    p. Metal Form Manufacturing, Inc.
    q. NCA Manufacturing, Inc.
    r. Nystrom, Inc.
    s. Pottorff.
    t. Reliable Automatic Sprinkler Co., Inc. (The).
    u. Reliable Products, Inc.
    v. Ruskin Company.
    w. United Enertech Corporation.
    x. Vent Products Co., Inc.

3. Louver Depth: 6 inches (150 mm).
4. Frame and Blade Nominal Thickness: Not less than 0.060 inch (1.52 mm) for blades and 0.080 inch (2.03 mm) for frames.
5. Mullion Type: Exposed.
6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same type and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Non-rewirable, U-shaped frames.

D. Louver Screening for Aluminum Louvers:

1. Bird Screening: Stainless steel, 1/2-inch-(13-mm-)square mesh, 0.047-inch (1.19-mm) wire.

2.5 BLANK-OFF PANELS

A. Insulated, Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.

1. Thickness: 2 inches (50 mm).
2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch (0.81-mm) nominal thickness.
3. Metal Facing Sheets: Galvanized-steel sheet, not less than 0.028-inch (0.71-mm) nominal thickness.
4. Metal Facing Sheets: Stainless-steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness.
5. Insulating Core: extruded-polystyrene foam.
6. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch (2.03-mm) nominal thickness, with corners mitered and with same finish as panels.
7. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
8. Panel Finish: Same finish applied to louvers.
9. Attach blank-off panels with sheet metal screws.

2.6 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.

3. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Post-installed Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.7 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
2. Horizontal Mullions: Provide horizontal mullions at joints unless continuous vertical assemblies are indicated.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Channel unless otherwise indicated.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less.

1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
2. Semi-recessed Mullions: Where indicated, provide mullions partly recessed behind louver blades so louver blades appear continuous. Where length of louver exceeds fabrication and handling limitations, fabricate with interlocking split mullions and close-fitting blade splices designed to permit expansion and contraction.
3. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

4. Exterior Corners: Prefabricated corner units with mitered blades with concealed close-fitting splices and with fully recessed mullions at corners.

F. Provide extended sills for recessed louvers.

G. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.8 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

C. High-Performance Organic Finish: 50 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 91 19

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

B. Related Requirements:

1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; roof rafters and ceiling joists.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.

B. Studs and Runners: ASTM C 645.

1. Steel Studs and Runners:

a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
b. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

D. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
2. Depth: 7/8 inch (22.2 mm).

E. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch-(13-mm-)wide flanges.

1. Depth: As indicated on Drawings.
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-(1.59-mm-)diameter wire, or double strand of 0.048-inch-(1.21-mm-)diameter wire.

2.2 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch diameter wire, or double strand of 0.048-inch diameter wire.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch-(13-mm-)wide flanges.

1. Depth: 1-1/2 inches (38 mm).

D. Furring Channels (Furring Members):

1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.

a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 24 inches (610 mm) o.c. unless otherwise indicated.
2. Tile Backing Panels: 16 inches (406 mm) o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

D. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches (1219 mm) o.c.
2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
3. Furring Channels (Furring Members): 24 inches (610 mm) o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Metal non-load bearing studs.
3. Accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

C. Samples for Initial Selection: For each type of trim accessory and textured finish indicated.

D. Samples for Verification: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for the following:

a. Each level of gypsum board finish indicated for use in exposed locations.
b. Each texture finish indicated.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

B. Interior Walls: Select stud thickness to resist minimum 5 psf uniform load and maximum 1/360 deflection.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Subject to compliance with requirements, provide products by one of the following.
   a. Georgia-Pacific Building Products
   b. National Gypsum Company
   c. United States Gypsum Company
2. Thickness: 5/8 inch (15.9 mm).
3. Long Edges: Tapered.

B. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Subject to compliance with requirements, provide products by one of the following.
   a. Georgia-Pacific Building Products
   b. National Gypsum Company
   c. United States Gypsum Company
2. Core: 5/8 inch (15.9 mm), Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc or paper-faced galvanized-steel sheet.
2. Shapes:

   a. Cornerbead.
   b. Bullnose bead.
   c. LC-Bead: J-shaped; exposed long flange receives joint compound.
   d. L-Bead: L-shaped; exposed long flange receives joint compound.
   e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
   f. Expansion (control) joint.
   g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized-steel sheet, plastic, or rolled zinc.
2. Shapes:

   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound or drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

D. Acoustical Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Subject to compliance with requirements, provide products by one of the following.
   a. Grabber Construction Products
   b. Pecora Corporation
   c. United States Gypsum Company

E. Acoustical Insulation: As specified in Section 07 21 00 "Thermal Insulation."

1. NRC: 0.55 according to ASTM C 423.

2.7 STEEL FRAMING MATERIALS

A. Studs and Tracks: ASTM C645; galvanized sheet steel, ‘C’ shaped with knurled faces. Provide 25 gauge at walls up to 10’-0” in height and 20 gauge for walls over 10’-0” in height.

B. Furring, Framing, and Accessories: ASTM C645. GA-216 and GA-600.

C. Fasteners: ASTM C514. length to suit application.

D. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

E. Subject to with requirements, provide products by one of the following.
1. Allied Stud co, Div. Of Allied Tube & Conduit.
2. Clark/Western.
3. Consolidated Fabricators Corp.
4. Dietrich Industries, Inc.
5. Marino\Ware - Div. Ware Ind.

F. Substitutions: Submit in accordance with Section 01 60 00 - Product Requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 METAL STUD INSTALLATION.

A. Install studs in accordance with ASTM C754, GA-216, and GA-600.

B. Metal Stud Spacing: 16 inches on center.

C. Door Opening Framing: Install double studs at door frame jambs.

D. Blocking: Bolt or screw steel channels to studs. Install blocking for support of the following, including, but not limited to, plumbing fixtures, toilet partitions, wall cabinets, wood frame opening, toilet accessories, hardware.

3.3 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.4 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings.
2. Type X: As indicated on Drawings.
3. Ceiling Type: As indicated on Drawings.
4. Mold-Resistant Type: At toilet and shower room ceilings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. U-Bead: Use at exposed panel edges.
3. Curved-Edge Cornerbead: Use at curved openings.

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.

2. Level 4: At panel surfaces that will be exposed to view.

    a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet, or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 00 - TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Ceramic tile for floor and wall applications.
2. Waterproof membrane.
3. Crack isolation membrane.
4. Tile backing panels.
5. Metal edge strips.

B. Related Sections:

1. Section 07 92 00 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.

2. Step Treads: Minimum 0.6.
3. Ramp Surfaces: Minimum 0.6.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Metal edge strips in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

C. Product Certificates: For each type of product, signed by product manufacturer.

D. Material Test Reports: For each tile-setting and -grouting product.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:

1. Waterproof membrane.
2. Crack isolation membrane.
3. Joint sealants.
4. Cementitious backer units.
5. Metal edge strips.

D. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained, and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. FloorScore Compliance: Tile for floors shall comply with requirements of FloorScore Standard.

D. Low-Emitting Materials: Tile flooring systems shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

A. Tile Type CT-1: As indicated in the drawings.

B. Tile Type CT-2: As indicated in the drawings.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Marazzi Tile, Inc.
2. American Olean; Division of Dal-Tile International Inc.

3. Daltile; Division of Dal-Tile International Inc.
4. Deutsche Steinzeug America, Inc.
5. Florida Tile Industries, Inc.
6. Florim USA.
7. Laufen.
8. Grupo Porcelanite.
9. Portobello America, Inc.
10. Seneca Tiles, Inc.
11. United States Ceramic Tile Company.

2.3 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, in maximum lengths available to minimize end-to-end butt joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. C-Cure; C-Cure Board 990.
b. Custom Building Products; Wonderboard.
c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
d. USG Corporation; DUROCK Cement Board.

2. Thickness: As indicated.

2.4 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.5 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product, selected from the following that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. PVC Sheet: Two layers of PVC sheet heat-fused together and to facings of nonwoven polyester; 0.040-inch nominal thickness.

1. Products: Subject to compliance with requirements, provide the following:

a. Compotite Corporation; Composeal Gold.

C. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.

1. Products: Subject to compliance with requirements, provide the following:

a. Schluter Systems L.P.; KERDI.

2.6 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Boiardi Products; a QEP company.
   b. Bonsal American; an Oldcastle company.
   c. Bostik, Inc.
   d. C-Cure.
   e. Custom Building Products.
   f. Jamo Inc.
   g. Laticrete International, Inc.
   h. MAPEI Corporation.
   i. Mer-Kote Products, Inc.
   j. Southern Grouts & Mortars, Inc.
   k. Summitville Tiles, Inc.
   l. TEC; a subsidiary of H. B. Fuller Company.

2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.7 GROUT MATERIALS

A. Polymer-Modified Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Boiardi Products; a QEP company.
   b. Bonsal American; an Oldcastle company.
   c. Bostik, Inc.
   d. C-Cure.
   e. Custom Building Products.
   f. Jamo Inc.
   g. Laticrete International, Inc.
   h. MAPEI Corporation.
   i. Southern Grouts & Mortars, Inc.
   j. Summitville Tiles, Inc.
   k. TEC; a subsidiary of H. B. Fuller Company.

2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

2.8 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 07 92 00 "Joint Sealants."

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

1. Products: Subject to compliance with requirements, provide one of the following:

a. DAP Inc.; 100 percent Silicone Kitchen and Bath Sealant.
b. Dow Corning Corporation; Dow Corning 786.
c. GE Silicones; a division of GE Specialty Materials; Sanitary 1700.
d. Laticrete International, Inc.; Latasil Tile & Stone Sealant.
e. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
f. Tremco Incorporated; Tremsil 600 White.

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.

C. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

E. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Bonsal American; an Oldcastle company; Grout Sealer.
    b. Bostik, Inc.; CeramaSeal Grout & Tile Sealer.
    c. C-Cure; Penetrating Sealer 978.
    d. Custom Building Products; Grout and Tile Sealer.
    e. Jamo Inc.; Penetrating Sealer.
    f. MAPEI Corporation; KER 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile.
    g. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
    h. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:

    a. Exterior tile floors.
    b. Tile floors in wet areas.
    c. Tile swimming pool decks.
    d. Tile floors in laundries.
    e. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
    f. Tile floors composed of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
1. Paver Tile: 1/4 inch.
2. Glazed Wall Tile: 1/16 inch.

G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

I. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

J. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 TILE BACKING PANEL INSTALLATION

A. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.7 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Tile Installation F113: Thin-set mortar; TCA F113.

    a. Tile Type: CT-1.
    b. Thin-Set Mortar: Latex portland cement mortar.
    c. Grout: Polymer-modified sanded grout.

2. Tile Installation F125A: Thin-set mortar on crack isolation membrane; TCA F125A.

    a. Tile Type: CT-1.
    b. Thin-Set Mortar: Latex portland cement mortar.
    c. Grout: Polymer-modified sanded grout.

B. Interior Wall Installations, Metal Studs or Furring:

1. Tile Installation W244: Thin-set mortar on cementitious backer units or fiber cement underlayment; TCA W244.

    a. Tile Type: CT-2.
    b. Thin-Set Mortar: Latex- portland cement mortar.
    c. Grout: Polymer-modified sanded, water-cleanable epoxy grout.

END OF SECTION 09 30 00

SECTION 09 51 13 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 BASE BID

A. General Contractor provide:

1. Suspended metal grid ceiling system
2. Acoustic panels
3. Perimeter trim

B. Related Sections:

1. Section 01 33 00 – Submittal Procedures

1.2 PERFORMANCE REQUIREMENTS

A. Suspension System: Rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1:360.

B. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment for Acoustical Panels: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

C. Grid System: High-Humidity finish complying with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance".

D. Seismic Standard: Provide acoustical panel ceiling system designed and installed to withstand effects of earthquake motions according to following:

1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings.”

1.3 SUBMITTALS

A. Action Submittals:

1. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to system. Indicate method of suspension where interference exists.

2. Product Data: Submit data on metal grid system components, acoustic units and perimeter trim.
3. Samples: Submit two full size samples illustrating material and finish of acoustic units.
4. Mock-ups as required.

B. For Closeout:

1. Project Record Documents.
2. Maintenance
3. Manufacturer’s instruction for cleaning and painting panels.
4. Delivery of extra materials.

1.4 QUALITY ASSURANCE

A. Conform to CISCA requirements.

B. Surface Burning Characteristics: Comply with the following when tested in accordance with NFPA 286.

C. Source Limitations for Ceiling Units: Obtain each type acoustical ceiling panel from one manufacturer source with resources to provide products of consistent quality in appearance and physical properties without delaying Work.

D. Source Limitations for Suspension System: Obtain each type of suspension system from one manufacturer with resources to provide products of consistent quality in appearance and physical properties without delaying Work.

E. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.5 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum 5 years experience.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustic unit installation.

B. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above

ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 SEQUENCING

A. Sequence Work to ensure acoustic ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Install acoustic units after interior wet work is dry.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed; packaged with protective covering for storage; and identified with labels describing contents.

1. For each type acoustical unit installed; furnish 5 percent of total acoustic units installed to Owner.

1.9 WARRANTY

A. Special Warranty:

1. Acoustical Panels free from:
    1. Defects in materials
    2. Defects in factory workmanship.
    3. Sagging and warping.

2. Suspension System free from:
    1. Occurrence of 20% or more red rust as defined by ASTM B117.
    2. Manufacturer’s defects.

3. Warranty Period: 15 years from date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acoustical Ceiling Panels (Type ACT-1): As indicated in the drawings, manufactured by one of the following.

1. CertainTeed Ceilings.
2. United States Gypsum Co.

3. Armstrong.

    a. Additional Manufacturers: Subject to compliance with requirements, acceptable products will meet or exceed quality, performance and meet aesthetics of Basis of Design Manufacturer’s specified product.

B. Acoustical Ceiling Panels (Type ACT-2): As indicated in the drawings, manufactured by one of the following.

1. CertainTeed Ceilings.
2. United States Gypsum Co.
3. Armstrong.

    b. Additional Manufacturers: Subject to compliance with requirements, the following manufacturers will be acceptable provided their products meet or exceed quality, performance and meet aesthetics of Basis of Design Manufacturer’s specified product.

C. Suspension Systems

1. For Acoustical Ceiling Panels: Non-rated; 9/16 inch wide; factory finish as selected by A/E from manufacturers full range; manufactured by one of the following:

    1. Armstrong World Industries.
    2. CertainTeed Ceilings.
    3. Chicago Metallic Corp.
    4. United States Gypsum Co.

D. Substitutions: Submit in accordance with Section 016000 - Product Requirements.

2.2 COMPONENTS

A. Grid Materials: Commercial quality cold rolled steel with galvanized coating.

1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

2. Accessories: clips, splices, perimeter moldings, hold down clips, and wire required for suspended grid system.

B. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

2. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

3. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.

    1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

D. Wire Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire but provide not less than 0.106-inch 0.135-inch diameter wire.

E. Touch-up Paint: Type and color to match acoustic and grid units.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify layout of hangers will not interfere with other work.

3.2 INSTALLATION

A. Lay-In Grid Suspension System:

1. Install suspension system in accordance with ASTM C635, ASTM C636 and as supplemented in this section.
2. Install system capable of supporting imposed loads to deflection of 1/360 maximum.
3. CISCA's "Ceiling Systems Handbook."

1. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2."

4. Locate system on room axis according to reflected plan.
5. Install after major above ceiling work is complete. Coordinate location of hangers with other work.
6. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
7. Where ducts and other equipment prevent regular spacing of hangers, install supplemental suspension members and hangers.
8. Do not support components on main runners or cross runners when weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.
9. Do not eccentrically load system or produce rotation of runners.
10. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
11. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
12. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
13. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.
14. Perimeter Molding Abutting Vertical Surfaces:

    1. Install edge molding at intersection of ceiling and vertical surfaces.
    2. Use longest practical lengths.
    3. Overlap corners.
    4. Install at junctions with other interruptions.
    5. Attach moldings to substrate with screws at intervals not more than 16 inches o.c. and not more than 3 inches from ends.
    6. Miter corners accurately and connect securely.

3.3 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling

components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage and provide new product.

3.4 ERECTION TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8-inch in 10-feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 09 51 13

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Thermoset-rubber base.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches (300 mm) long.

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches (300 mm) long.

E. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Coordinate mockups in this Section with mockups specified in other Sections.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

A. Manufacturers:

1. Subject to compliance with requirements, provide products by one of the following.
   a. Flexco
   b. Johnsonite; a Tarkett Company
   c. Roppe Corporation, USA

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location:

a. Style B, Cove: Provide in areas indicated.

C. Thickness: 0.125 inch (3.2 mm).

D. Height: 4 inches (102 mm).

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Colors: As selected by Architect from manufacturer's full range.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 6 inches (150 mm) in length.

a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 6 inches (150 mm) in length.

a. Miter or cope corners to minimize open joints.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.
2. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 65 19 – LUXURY VINYL TILE

PART 1 - GENERAL

1.1 BASE BID

A. General Contractor Provide:

1. Luxury Vinyl Tile
2. Transition Strips
3. Expansion Joint Covers

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.

C. Samples: Full-size units of each color and pattern of floor tile required.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. FloorScore Compliance: Resilient tile flooring shall comply with requirements of Floor Score certification.

C. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 LUXURY VINYL FLOOR TILE

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Raskin, Elevations Loose Lay.

B. Tile Standard: ASTM F 1700.

C. Wearing Surface: Smooth: Match existing adjacent.

D. Thickness: 1/5 inch (5.0 mm)

E. Size: 12 x 24.

F. Colors and Patterns: As selected by Architect from Manufacturer’s full range.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.2 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis to continue existing pattern.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles to match existing.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

SECTION 09 65 66 - RESILIENT ATHLETIC FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Resilient Athletic Flooring.

B. Related Sections:
   1. Section 09 65 13 "Resilient Wall Base" for wall base and accessories installed with flooring.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation details and locations of the following:

   1. Border tiles.
   2. Floor patterns.
   3. Seam locations for sheet flooring.

C. Samples for Initial Selection: For each type of flooring indicated.

D. Samples for Verification: For each type, color, and pattern of flooring indicated, 6-inch-square Samples of same thickness and material indicated for the Work.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For flooring to include in maintenance manuals.

1.5 MATERIALS MAINTENANCE SUBMITTALS

A. Furnish extra materials, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish no fewer than 1 box for each 10 boxes or fraction thereof, of each type, color, pattern, and size of floor tile installed.
2. Sheet Flooring: Furnish full width rolls of not less than 10 linear feet for each 50 linear feet or fraction thereof, of each type, color, and pattern of flooring installed.

1.6 QUALITY ASSURANCE

A. Manufacturer must be certified ISO 9001.

B. Manufacturer must have a minimum of fifteen (15) years of experience in the manufacturing of prefabricated resilient athletic flooring.

C. Installer must have performed installations of the same scale in the last three (3) years.

D. Installer to be recognized and approved by the resilient athletic flooring Manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storing.

B. Store materials to prevent deterioration. Store tiles on flat surfaces and rolls upright.

1.8 FIELD CONDITIONS

A. Adhesively Applied Products:

1. Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
2. After post-installation period, maintain temperatures within the range recommended in writing by manufacturer, but not less than 55 deg F or more than 95 deg F.
3. Close spaces to traffic during flooring installation.
4. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.

B. Install flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT ATHLETIC SHEET FLOORING

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated in the drawings or approved equal.

B. Description: Prefabricated resilient rubber athletic flooring, calendared and vulcanized with a base of natural and synthetic rubbers, stabilizing agents, and pigments.

C. Material: Rubber wear layer and rubber shock-absorbent layer, vulcanized together.

D. Performance
   1. Performance of the prefabricated resilient athletic flooring to conform to the following criteria:

Performance Criteria	Test Method	Result
Tensile Strength	ASTM D412	≥300psi
Elongation at Break	ASTM D412	≥100%
Coefficient of Friction	ASTM D2047	≥0.80
Hardness Shore A	ASTM D2240	75 ± 5 (wear layer) 70 ± 5 (backing)
Taber Abrasion (H18 wheel, 1000g, 1000 cycles)	ASTM D3389	<0.6g loss
Critical Radiant Flux	ASTM E648	≥0.45 W/cm^2, Class 1
Optical Density of Smoke	ASTM E662	<450
Thickness	ASTM F386	10mm ± 0.2
Chemical Resistance	ASTM F925	Compliant
Static Load Limit (tested at 250psi)	ASTM F970	≤0.008in
Resistance to Heat	ASTM F1514	Compliant
Color Light Stability	ASTM F1515	Compliant
Indoor Air Quality	CA 01350	Compliant
GREENGUARD Certification	Greenguard	Yes
GREENGUARD Gold	Greenguard	Yes

E. Traffic-Surface Texture: As selected by Architect from manufacturers full range of current standard finish textures.

F. Roll Size: Not less than 48 inches wide by longest length that is practical to minimize splicing during installation.

G. Thickness: .394”/10 mm.

H. Color and Pattern: As selected by Architect from manufacturers full range of current standard colors and finish patterns.

2.2 ACCESSORIES

A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.

B. Adhesives: Water-resistant type recommended in writing by manufacturer for substrate and conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Ensure that concrete subfloors on or below grade are installed over a permanent effective vapor retarder, as per current versions of ASTM E1643 and ASTM E1745. The vapor retarder must be placed directly underneath the concrete slab, above the granular fill, as per Manufacturer's instructions. The vapor retarder must have a perm rating of 0.1 or less and must have a minimum thickness of 10 mils.

C. Installation to be carried out no sooner than the specified curing time of concrete subfloor (normal density concrete curing time is approximately 28 days for development of design strength). Refer to current version of ASTM F710.

D. Ensure that no concrete sealers or curing compounds have been applied to or mixed into the concrete (refer to Section 03 05 00 – Common Work Results for Concrete of Division 3).

E. Subfloor surface must be free of any paint, wax, oil, grease, sealer, curing compound, solvent or any other contaminants that may inhibit bond. All contaminants must be removed from the surface via mechanical abatement.

F. Smooth, dense finish, highly compacted with a tolerance of 1/8'' in a 10 ft radius (3.2 mm in 3.05 m radius). Floor Flatness (FF) and Floor Levelness (FL) numbers are not recognized.

G. Moisture and alkalinity tests must be performed on all concrete substrates, under in-service conditions. It is recommended to turn on the HVAC unit prior to performing moisture testing, in order to ensure stable testing conditions and accurate results. The concrete's surface pH should be between 7 and 10. Relative humidity of the concrete slab must not exceed the tolerance of the adhesive specified, in accordance with ASTM F2170 (in situ probes). Moisture vapor emissions from the concrete slab must not exceed the tolerance of the adhesive specified, in accordance with ASTM F1869 (anhydrous calcium chloride).

H. Maintain a stable room and subfloor temperature within the recommended range of 65 deg F to 86 deg F (18 deg C to 30 deg C), 48 hours prior to installation, during the installation, and 48 hours after the installation. Recommended ambient humidity control level is between 35 to 55%.

I. Installation of resilient athletic flooring will not commence until the building is enclosed and all other trades have completed their work.

J. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of flooring.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Alkalinity Testing: Perform pH testing according to ASTM F 710. Proceed with installation only if pH readings are not less than 7.0 and not greater than 8.5.
3. Moisture Testing:

a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

b. Perform relative humidity test using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Move flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.

1. Do not install flooring until they are same temperature as space where they are to be installed.

F. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 FLOORING INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions.

B. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.

C. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.

D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on flooring. Use nonpermanent, non-staining marking device.

3.4 SHEET FLOORING INSTALLATION

A. Unroll sheet flooring and allow it to stabilize before cutting and fitting.

B. Lay out sheet flooring as follows:

1. Maintain uniformity of flooring direction.
2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
3. Match edges of flooring for color shading at seams.
4. Locate seams per approved Shop Drawings.

C. Adhered Flooring: Adhere products to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.

1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.5 CLEANING AND PROTECTING

A. Perform the following operations as recommended by the Manufacturer:

1. Remove adhesive and other blemishes from flooring surfaces.
2. Sweep and vacuum flooring thoroughly.
3. Damp-mop flooring to remove marks and soil after time period recommended in writing by manufacturer.

B. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 09 65 66

SECTION 09 67 00 – FLUID-APPLIED FLOORING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes fluid-applied high-density epoxy flooring and base; divider strips and accessories; as shown on Drawings, schedules and specified herein.

B. Related Sections:
1. Section 07 90 00 – Joint Protection: Joint between base and wall surface.
2. Section 09 65 00 – Resilient Flooring.

1.2 REFERENCES

A. ASTM International:
1. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
2. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
3. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
4. ASTM D905 - Standard Test Method for Strength Properties of Adhesive Bonds in Shear by Compression Loading.
5. ASTM D1044 - Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.
6. ASTM D1360 - Standard Test Method for Fire Retardancy of Paints (Cabinet Method).
7. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on specified products, describing physical and performance characteristics; sizes, patterns, and colors available.

C. Samples: Submit two samples, 6 x 6-inch in size illustrating color and pattern for each floor material for each color specified.

D. Manufacturer’s Certificate: Certify products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Submit special procedures, and perimeter conditions requiring special attention.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing work of this section with minimum three years experience, approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Store resin materials in dry, secure area.

C. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Maintain minimum temperature in storage area of 60 degrees F, and a maximum storage temperature of 90 degrees F.

C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.1 FLUID-APPLIED FLOORING

A. Manufacturers:
1. Dur-a-Flex, Inc., East Hartford, CT, 800/253-3539.
2. Desco Systems, St. Louis, MO. 800/373-8128
3. Stonhard, Inc., Maple Shade, NJ, 800/257-7953.
4. Crown Polymers, Hampshire, IL; (847) 683-0800.
5. Substitutions: Section 01 60 00 – Product Requirements.

B. Approved Systems:
1. Dur-a-Flex: Dur-a-Quartz.
2. Desco Quartz Cremona
3. Stonhard, Inc.: Stonshield SLT.

4. Crown Polymers: CrownQuartz.
5. Substitutions: Section 01 60 00 – Product Requirements.

2.2 COMPONENTS

A. Fluid-Applied Flooring: Epoxy, single or two component, thermosetting, colored with mineral filler, with aggregate embedded in base coat.
   1. Base Coat: 1/8 inch thick; of color as selected by Architect/Engineer from manufacturer's standard color selection.
   2. Aggregate: Small quartz chips of single color or multiple colors as selected.
   3. Top Coat: Epoxy, single or two component, thermosetting; 1/8 inch thick; clear.
   5. Top Coat to receive slip resistant quartz aggregate grade Q11 in a double broadcast system to produce a high degree of permanent slip resistance in the Apparatus Bay shower area.

2.3 ACCESSORIES

A. Divider Strips: Extruded mill finished aluminum, 1/8 inch thick, height to match flooring thickness, with anchoring features; color as selected by Architect/Engineer.

B. Control Joint Strips: Match divider strips; 1/4-inch nominal width, 1/8-inch-wide neoprene filler strip between side strips, with anchoring features, strip height to suit flooring thickness.

C. Base Caps, and Separator Strips: Match divider strips, with projecting base of 1/8-inch.

D. Fillet Strips: Molded material compatible with flooring.

E. Subfloor Filler: Type recommended by flooring material manufacturer.

F. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify floor surfaces are smooth and flat with maximum variation as specified in Section 03 30 00 and are ready to receive work.

C. Verify concrete floors have cured minimum 28 days, exhibit negative alkalinity, carbonization, and dusting, and are acceptable to flooring manufacturer.

D. Verify floor and lower wall surfaces are free of substances capable of impairing adhesion of adhesive and finish materials.

3.2 PREPARATION

A. Prepare surfaces as required by manufacturer.

B. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

D. Clean substrate.

E. Apply primer as required to prevent "bleed-thru" or interference with adhesion by substances that cannot be removed.

3.3 INSTALLATION

A. Accurately saw cut substrate to install divider strips.

B. Install strips straight and level at locations indicated.

C. Install fillet strips at base of walls where flooring is to be extended up wall as base.

D. Install base divider strips to match floor pattern. Install terminating cap strip at top of base; attach securely to wall substrate.

E. Apply each coat of flooring within thickness range required by manufacturer.

F. Finish to smooth level surface.

G. Install flooring in recessed type floor access covers.

3.4 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Prohibit traffic on floor finish until cured.

C. Barricade area to protect flooring until cured.

END OF SECTION 09 67 00

SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Contractor provide modular, carpet tile.

B. Related Requirements:

1. Section 09 65 13 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.

6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.10 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, loss of tuft bind strength, loss of face fiber, and delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Products: Subject to compliance with requirements, provide one of the following:

1. EF Contract.
2. Shaw Contract Group.
3. Mohawk Commercial.
4. Interface

B. Color: As selected by Architect from manufacturer's full range.

C. Pattern: Quarter turn.

D. Fiber Content: 100 percent nylon 6, 6.

E. Fiber Type: Nylon.

F. Pile Characteristic: Multi-level pattern loop pile.

G. Density: 6545 oz./cu. yd. (12.19 kilotex).

H. Pile Thickness: .132” inches (3.35 mm) for finished carpet tile according to ASTM D 6859.

I. Stitches: 11.0 per inch (43.31 per 10 cm).

J. Gage: 1/12 per inch (47.24 per 10 cm).

K. Total Weight: not less than 18 oz./sq. yd. (610.30 g/sq. m)> for finished carpet tile.

L. Primary Backing/Back coating: Manufacturer's standard composite materials

M. Secondary Backing: Manufacturer's standard material.

N. Size: 24 by 24 inches (610 by 610 mm).

O. Applied Soil-Resistance Treatment: Manufacturer's standard material.

P. Antimicrobial Treatment: Manufacturer's standard material.

Q. Performance Characteristics: As follows:

1. Appearance Retention Rating: Severe traffic, 3.5 minimum according to ASTM D 7330.
2. Critical Radiant Flux Classification: Not less than 0.22 W/sq. cm.
3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
4. Tuft Bind: Not less than 6.2 lbf (28 N) according to ASTM D 1335.
5. Delamination: Not less than 4 lbf/in. (18 N/mm) according to ASTM D 3936.
6. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
8. Resistance to Insects: Comply with AATCC 24.
9. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
10. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
11. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.
12. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

13. Emissions: Provide carpet tile that complies with testing and product requirements of CRI's "Green Label Plus" program.
14. Emissions: Provide carpet tile that complies with the product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Metal Edge/Transition Strips: Extruded PVC with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
2. Subfloor finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes, and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosing. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.

G. Install pattern parallel to walls and borders.

H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 91 13 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on exterior substrates.

1. Hollow Metal Doors and Frames.

B. Related Requirements:

1. Section 08 11 13 "Hollow Metal Doors and Frames”.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

   a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
   b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

   a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following.

1. Benjamin Moore & Co.
2. Glidden Professional
3. PPG Architectural Coatings
4. Sherwin Williams

B. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: As selected by Architect from manufacturer's full range.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.

1. SSPC-SP 2 and SSPC-SP3.

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Factory Primed Hollow-Metal Door Substrates:

1. Latex System MPI EXT 5.3A:

a. Prime Coat: Touch-Up Primer, galvanized, water based, MPI #134.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.

END OF SECTION 09 91 13

SECTION 09 91 23 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on interior substrates.

1. Concrete masonry units (CMUs)
2. Steel and iron.
3. Galvanized metal.
4. Gypsum board.
5. Cotton or canvas insulation covering.

B. Related Requirements:
1. Section 051200 “Structural Steel Framing” for shop priming structural steel.
2. Section 055000 “Metal Fabrications” for shop priming metal fabrications.
3. Section 055113 “Metal Pan Stairs” for shop priming metal pan stairs.
4. Section 055213 “Pipe and Tube Railings” for shop priming pipe and tube railings.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the requirements, provide products by one of the following.

1. Benjamin Moore & Co.
2. Glidden Professional
3. PPG Architectural Coatings
4. Sherwin Williams

B. Products: Subject to compliance with requirements, provide one of the products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: As selected by Architect from manufacturer's full range.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
2. Masonry (Clay and CMUs): 12 percent
3. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer’s written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surface is moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer’s written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 2 and SSPC-SP3.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint the following work where exposed in occupied spaces:
   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.
   g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   h. Other items as directed by Architect.
2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Masonry Unit Substrates:

1. Institutional Low-Odor/VOC Latex System MPI INT 4.2E:

a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.

B. Steel Substrates:

1. Institutional Low-Odor/VOC Latex System MPI INT 5.1S:

a. Prime Coat: Primer, rust inhibitive, water based MPI #107.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.

C. Galvanized-Metal Substrates:

1. Institutional Low-Odor/VOC Latex System MPI INT 5.3N:

a. Prime Coat: Primer, galvanized, water based, MPI #134.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.

D. Gypsum Board Substrates:

1. Institutional Low-Odor/VOC Latex System MPI INT 9.2M:

a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.

c. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 2), MPI #144 at horizontal ceiling locations.
d. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147 at vertical wall and soffit locations.

END OF SECTION 09 91 23

SECTION 10 11 16 – FIXED MARKER BOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fixed marker board assemblies.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
2. Include electrical characteristics for motorized units.

B. Shop Drawings: For visual display units.

1. Include plans, elevations, sections, details, and attachment to other work.
2. Show locations of panel joints. Show locations of field-assembled joints for factory-fabricated units too large to ship in one piece.
3. Show locations and layout of special-purpose graphics.
4. Include sections of typical trim members.

C. Samples for Initial Selection: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:

1. Samples of facings for each visual display panel type, indicating color and texture.
2. Fabric swatches of fabric facings for tackboards.
3. Factory-finish color samples, applied to aluminum substrate.
4. Include accessory Samples to verify color selected.

D. Samples for Verification: For each type of visual display unit indicated.

1. Visual Display Panel: Not less than 8-1/2 by 11 inches (215 by 280 mm), with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.
2. Trim: 6-inch- (150-mm-) long sections of each trim profile.
3. Display Rail: 6-inch- (150-mm-) long section of each type.
4. Accessories: Full-size Sample of each type of accessory.

E. Product Schedule: For visual display units.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of tackboards.

C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by the manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.9 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Surfaces lose original writing and erasing qualities.
b. Surfaces exhibit crazing, cracking, or flaking.

2. Warranty Period: 50 years from date of Substantial Completion.
3. Warranty Period: Life of the building.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 FIXED MARKER BOARD ASSEMBLY

A. Manufacturers:
1. Subject to compliance with requirements, provide products by one of the following.
a. AARCO Products, Inc.
b. Claridge Products and Equipment, Inc.
c. EverWhite, Inc.

B. Fixed Marker Board Assembly: factory fabricated.

1. Assembly: markerboard.
2. Corners: Square.
3. Width: 12’-0”.
4. Height: 4’-0”.

5. Mounting Method: Direct to wall with concealed clips or fasteners.

C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on 24 ga. galvanized steel core.

1. Color: White.

D. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; standard size and shape.

1. Field-Applied Trim: Manufacturer's standard, snap-on trim with no visible screws or exposed joints.
2. Aluminum Finish: Clear anodic finish.

E. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.

F. Marker Tray: Manufacturer's standard; continuous.
1. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

G. Display Rail: Manufacturer's standard, extruded-aluminum display rail with plastic-impregnated-cork insert, end stops, and continuous paper holder, designed to hold accessories.

1. Size: 2 inches (50 mm) full length of visual display unit.
2. Tackboard Insert Color: As selected by Architect from full range of industry colors.
3. Aluminum Color: Match finish of visual display assembly trim.

H. Paper Holder Display Rail: Extruded aluminum; designed to hold paper by clamping action.

2.4 MATERIALS

A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.

B. Plastic-Impregnated-Cork Sheet: Seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto fabric backing; with washable vinyl finish and integral color throughout with surface-burning characteristics indicated.

C. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063.

D. Adhesives for Field Application: Mildew-resistant, non-staining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application as recommended in writing by visual display unit manufacturer.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper preparation and backing for visual display units.

C. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.

3.3 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines

straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Field-Assembled Visual Display Board Assemblies: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
2. Where size of visual display board assemblies or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

C. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches (400 mm) o.c. Secure tops and bottoms of boards to walls.

D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated below.
1. Mounting Height: 36 inches (914 mm) above finished floor to top of marker tray.

3.4 CLEANING AND PROTECTION

A. Clean fixed marker boards according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 10 11 16

SECTION 10 14 16 – PLAQUES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Cast Bronze Dedication Plaques are included in this project by Allowance, per Section 01 21 00 “Allowances”.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION 10 14 16

SECTION 10 14 19 – DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Exterior Building Mounted Dimensional Letter Signage is included in this project by Allowance, per Section 01 21 00 “Allowances”.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION 10 14 19

SECTION 10 14 23 – PANEL SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes interior signs.

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate sign styles, lettering font, foreground and background colors, locations, overall dimensions of each sign.

C. Samples: Submit two signs, illustrating type, style, letter font, and colors specified; method of attachment.

D. Manufacturer's Installation Instructions: Submit installation template and attachment devices.

1.3 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Package signs, labeled in name groups.

C. Store adhesive attachment tape at ambient room temperatures.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Do not install signs when ambient temperature is lower than recommended by manufacturer.

C. Maintain this minimum temperature during and after installation of ss.

PART 2 PRODUCTS

2.1 INTERIOR SIGNS

A. Manufacturers:
1. APCO Graphics.
2. ASI Sign Systems.
3. Inpro Corporation.

2.2 COMPONENTS

A. ADA compliant signs will consist of polyester-based photopolymer, photo-exposed and processed to achieve raised 1/32 inch raised letters and Braille. Photopolymer is then laminated to an acrylic back plate as required by the sign type. Copy color is to be applied by silk-screening or hot stamping. Raised lettering and Braille are to be integral with the sign face. The following methods of producing raised letter and Braille are not acceptable:
1. Glued-on plastic letters and Braille strips.
2. Engraving or routing to achieve raised letters and Braille.

B. Signs shall comply with ADA regulations with the requirements indicated for materials, thicknesses, finish, contrast, shapes, sized, and details of construction. Installed dimensional tolerances to be plus/minus 1/16 inch.

C. Graphics to be precisely formed by manufacturer's photomechanical stratification process to comply with the following:
1. Braille: Grade 2 Braille including 189 part-work or whole work contractions in addition to Grade 1 Braille 63 characters. Tactile is required whenever Braille is required.
2. Non-Tactile: Letters and numbers shall have a width-to-height ratio between 3:5 and 1:1 and stroke width ratio between 1:5 and 1:10 using upper case "X" to calculate ratios. Use typestyles with medium weight; upper- and lower-case lettering is not permitted; serif typestyles are not permitted.
3. Symbols: Symbol itself is not required to be tactile but equivalent verbal description is required both in tactile letters and Braille.
4. Tactile: 1/32 inch raised capital letters without serifs at least 5/8-inch height and not more than 2 inches height based on upper case "X". Braille is required whenever tactile is required.
a. Individually applied characters are prohibited.

2.3 FINISHES

A. Paints: Background color shall be applied, via spray application, over entire ADA (photopolymer) portion of plaque using airdried polyurethane. Spraying copy color first followed by floor coating is prohibited. Roller coated copy is not acceptable.

B. Finishes: Background and copy finish shall be clean, sharp, and free of airborne debris and “orange peel” texture.

C. Topcoat: Entire plaque shall be spray top coated with a clear matte urethane to protect the surface painted surface.

2.4 ACCESSORIES

A. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

3.2 INSTALLATION

A. Install signs after doors and surfaces are finished, in locations indicated on Drawings.

B. Locate sign on wall surface, level, **54**-inches to sign centerline above floor adjacent to latch side of door.

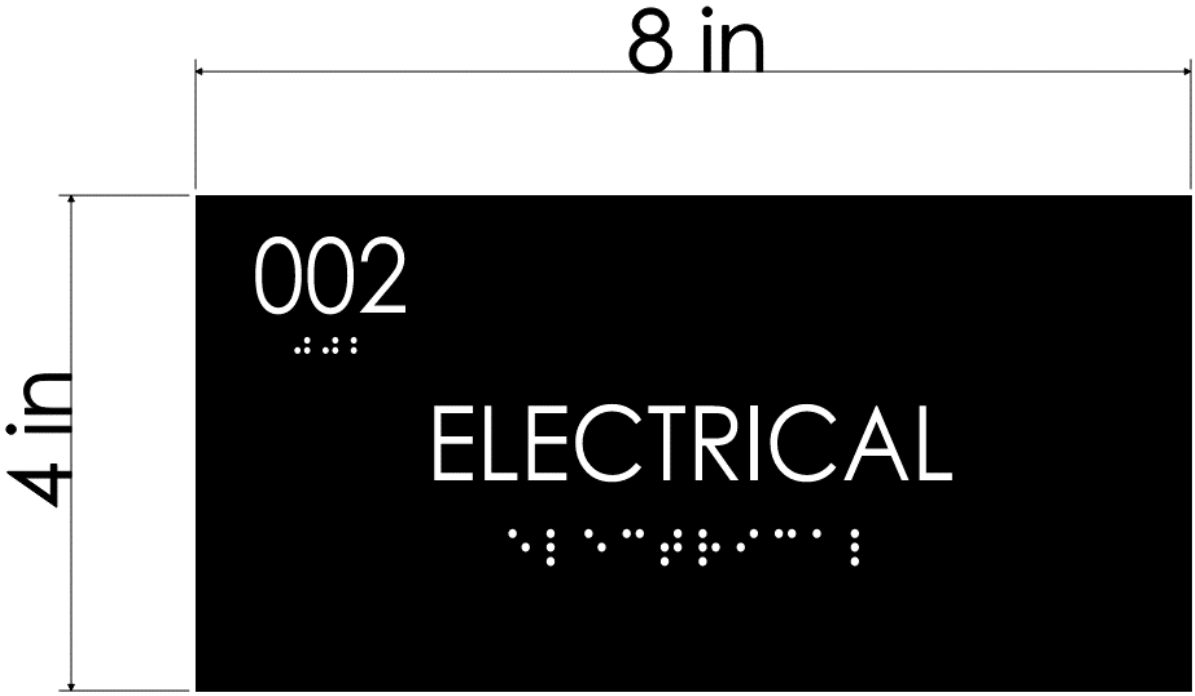
3.3 SCHEDULES

SIGN QUANTITY	ROOM NAME	ROOM NUMBER	**TYPE**
VILLAGE HALL:			
1	PUBLIC WORKS	116	**A**
1	CONFERENCE	119	**A**
2	ASSISTANT COMPTROLLER	121	**A**
1	STORAGE	129	**A**
1	MAIN TELECOMMUNICATIONS	130	**A**
POLICE ADDITION:			
1	LOBBY	102	**A**
1	JANITOR	102A	**A**
1	RESTROOM	103	**B**
1	RESTROOM	104	**B**
2	EOC TRAINING	105	**A**
1	CLOSET	105B	**A**
1	TELECOMMUNICATIONS	106	**A**
1	INTERVIEW	107	**A**
1	EMPLOYEES ONLY	108	**A**
1	INTERNAL WAITING	110	**A**

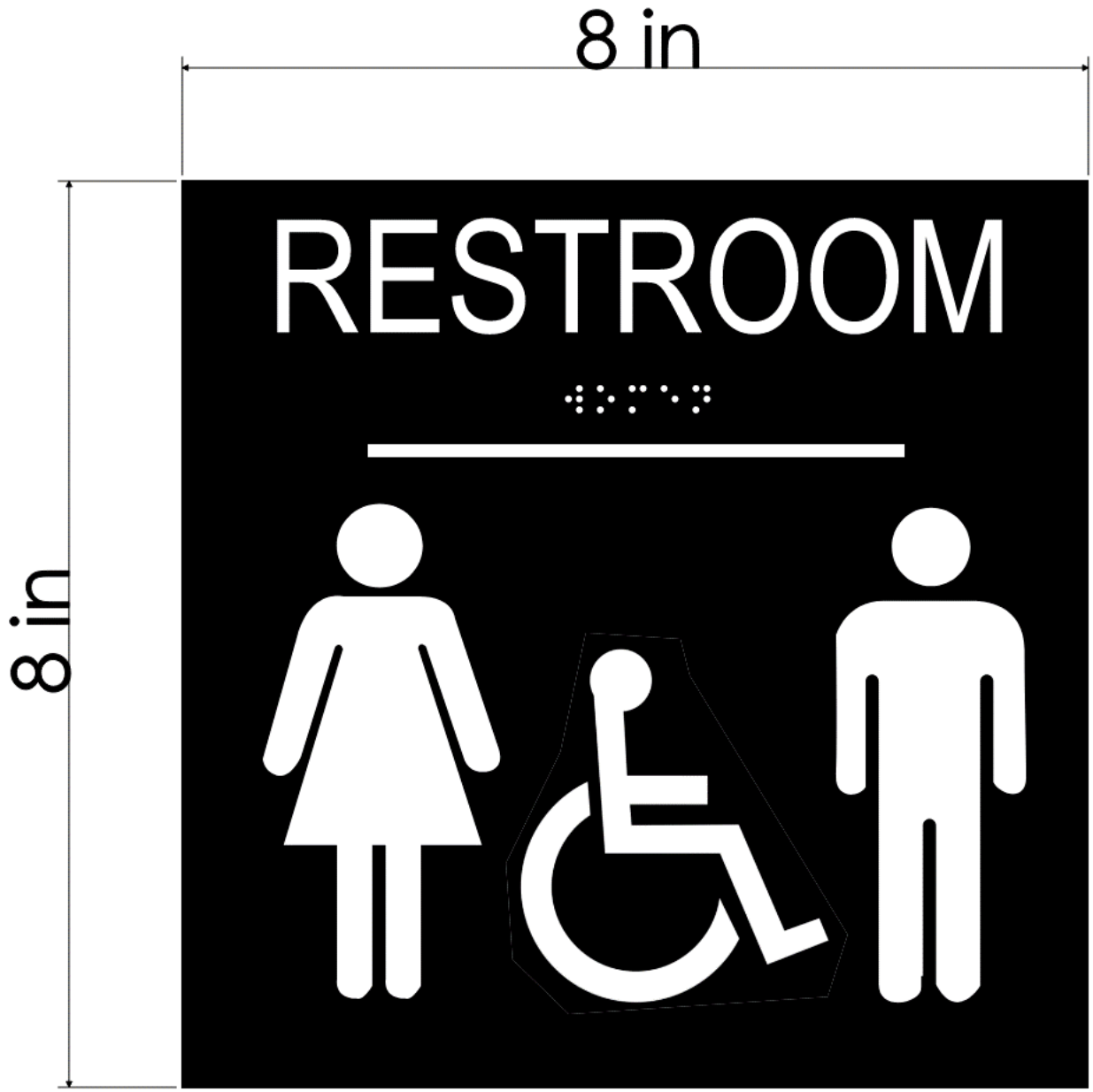
1	FILES/STORAGE	111	**A**
1	DARE/SERGEANT	112	**A**
1	CONFERENCE	113	**A**
1	DEPUTY CHIEF	114	**A**
1	CHIEF	115	**A**
1	RECORDS CLERK	118	**A**
1	RESTROOM	121	**B**
1	ARCHIVE STORAGE	122	**A**
1	WORK/COPY/FILE/STORAGE	123	**A**
1	SERGEANT	124	**A**
1	PATROL	125	**A**
2	RECEIVING/STORAGE	126	**A**
1	ARMORY	128	**A**
1	PATROL STORAGE	129	**A**
1	JANITOR	131	**A**
1	WOMENS LOCKER	132	**A**
1	TOILET/SHOWER	133	**B**
1	MENS LOCKER	134	**A**
1	TOILET/SHOWER	135	**B**
1	TOILET/SHOWER	136	**B**
1	TOILET/SHOWER	137	**B**
1	FITNESS	138	**A**
1	MECHANICAL/IT	139	**A**
1	ELECTRIC	139B	**A**
1	COMMON EQUIPMENT	140	**A**
1	INVESTIGATOR	141	**A**
1	PROCESSING	142	**A**
1	PROPERTY CUSTODY STORAGE	143	**A**
1	EVIDENCE STORAGE	144	**A**
1	CELL	145	**A**
1	JANITOR	146	**A**
1	INTERVIEW	147	**A**
1	INTERVIEW	148	**A**
1	CELL	152	**A**
1	CELL	153	**A**
1	CELL	154	**A**
1	CELL	155	**A**
2	SALLY PORT STORAGE	157	**A**
1	VEHICLE PROCESSING	158	**A**

3.4 SIGN TYPES

TYPE – A:



TYPE – B:



END OF SECTION 10 14 00

SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes toilet accessories, and utility room accessories.

B. Related Sections:
1. Section 06 10 53 - Miscellaneous Rough Carpentry: In-wall framing and plates.
2. Section 10 21 13 - Toilet Compartments.

1.2 REFERENCES

A. ASTM International:
1. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless-Steel Tubing for General Service.
4. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
5. ASTM A666 - Standard Specification for Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar.
6. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
7. ASTM C1036 - Standard Specification for Flat Glass.

B. Federal Specification Unit:
1. FS A-A-3002 - Mirrors, Glass.

1.3 DESIGN REQUIREMENTS

A. Design grab bars, and attachments to resist minimum 250 lb concentrated load applied at any point in any direction as required by applicable code.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, attachment methods.

C. Manufacturer's Installation Instructions: Submit special procedures, conditions requiring special attention.

1.5 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate the Work with placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 PRODUCTS

2.1 TOILET AND BATH ACCESSORIES

A. Manufacturers:
1. A & J Washroom Accessories.
2. American Specialties, Inc.
3. Bobrick Washroom Accessories.
4. Bradley Corp.
5. Koala Corp.
6. Diaper Deck and Company.
7. Dyson

2.2 COMPONENTS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
1. Grind welded joints smooth.
2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Furnish 6 keys for each accessory to Owner; master key accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269, stainless steel.

E. Mirror Glass: Float glass, Type I, Class 1, Quality q2 (ASTM C 1036), with silvering, copper coating, and suitable protective organic coating to copper backing in accordance with FS A-A-3002.

F. Adhesive: Contact type, waterproof.

G. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof.

H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 TOILET ROOM ACCESSORIES

A. Toilet Paper Dispenser:
1. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
2. Mounting: Surface mounted.
3. Controlled delivery units cannot be used at accessible toilets.
4. Operation: Non-controlled delivery with theft-resistant spindle.
5. Capacity: Designed for 5-inch-(127-mm-) diameter tissue rolls.
6. Material and Finish: Stainless steel, No. 4 finish (satin).

B. Towel Dispenser: Provided by Owner and installed by Contractor.

C. Soap Dispenser: Provided by Owner and installed by Contractor.

D. Mirrors: Stainless steel framed, 6 mm thick tempered glass mirror.
1. Size: 24x36 minimum or as indicated on Drawings.
2. Frame: 0.05-inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No. 4 finish.
3. Backing: Full mirror sized, minimum 0.03-inch galvanized steel sheet and non-absorptive filler material.

E. Grab Bars: Stainless steel, 11/4 inches outside diameter, minimum 0.05-inch wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.
1. Length and configuration: As indicated on Drawings.
2. Required lengths: 24, 36, 42, and 48 inches.

F. Sanitary Napkin Disposal Unit: Stainless steel, semi-recessed mounting with adjustable flanges, self-closing door, locking bottom panel with full-length stainless-steel piano-type hinge, removable receptacle.

G. Baby Changing Station: Shall be constructed of polypropylene and a unibody steel chassis and shall support 200 pounds with minimal deflection. The station shall include child protection straps and bag hooks. Bed surface shall contain antimicrobial coating, reducing odor causing bacteria. Liner dispenser shall feature two liner cavities. Each cavity shall hold 25 liners, for a combined total of 50 liners per unit.

H. Shower Curtain Rod:

1. Description: 1-1/4-inch (32-mm) OD; fabricated from nominal 0.05-inch-(1.3-mm-) thick stainless steel.
2. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
3. Finish: Stainless steel, No. 4 finish (satin).
4. Provide one curtain rod per shower of size appropriate to fit shower openings shown in drawings.

I. Shower Curtain:
1. Size: Minimum 12 inches (305 mm) wider than opening by 72 inches (1828 mm) high.
2. Material: Nylon-reinforced vinyl, minimum 10 oz. (284 g) or 0.008-inch-(0.2-mm-) thick vinyl, with integral antibacterial agent.
3. Antibacterial shower curtains are available in green.
4. Color: White.
5. Grommets: Corrosion resistant at minimum 6 inches (152 mm) o.c. through top hem.
6. Shower Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.

J. Robe Hook:
1. Description: Double-prong unit.
2. Material and Finish: Stainless steel, No. 4 finish (satin).
3. Provide one (1) per toilet room and two (2) per shower room.

K. Underlavatory Guard:
1. Subject to compliance with requirements, provide products by one of the following.
   a. Plumberex Specialty Products, Inc.
   b. Truebro by IPS Corporation
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.4 JANITOR ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05-inch-thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06-inch steel wall brackets.
1. Drying Rod: Stainless steel, 1/4-inch diameter.
2. Hooks: 3, 0.06-inch stainless steel rag hooks at shelf front.
3. Mop/broom holders: 4 spring-loaded rubber cam holders at shelf front.
4. Length: 36 inches.
5. Provide shelf / mop and broom holder at janitor closets.

2.5 FACTORY FINISHING

A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, Type SC 2, satin finish, unless otherwise noted.

C. Back paint components where contact is made with building finishes to prevent electrolysis.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify exact location of accessories for installation.

C. Verify field measurements are as indicated on product data.

D. See Section 06 10 53 for installation of blocking reinforcing plates concealed anchors and in walls.

3.2 INSTALLATION

A. Install plumb and level, securely and rigidly anchored to substrate.

B. Mounting Heights and Locations: As required by accessibility regulations and as follows:
1. Bottom of Mirrors: 40 inches to bottom of reflecting surface.
2. Grab Bars at Barrier-Free Stalls: 36 inches to centerline of grab bar.

3.3 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00

SECTION 102813.63 - DETENTION TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Miscellaneous toilet accessories.
2. Stainless-steel mirrors.
3. Grab bars.

B. Related Requirements:

1. Section 013513.16 "Special Project Procedures for Detention Facilities" for general requirements for detention work.
2. Section 102800 "Toilet, Bath, and Laundry Accessories" for non-detention toilet accessories.

1.3 COORDINATION

A. Coordinate installation of anchorages for detention toilet accessories. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in adjoining construction. Deliver such items to Project site in time for installation.

B. Coordinate size and location of recesses in wall construction to receive recessed detention toilet accessories.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Product Schedule: For detention toilet accessories. Indicate types, quantities, sizes, and installation locations by room of each accessory required.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Location of each built-in anchor supporting detention toilet accessories, including anchors to be installed as work of other Sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Locations, dimensions, and profiles of wall and floor reinforcements.
2. Elevations of each detention toilet accessory showing dimensions of accessory, preparations for receiving anchors, and locations of anchorage.
3. Details of attachment of each detention toilet accessory to built-in anchors.

PART 2 - PRODUCTS

2.1 MISCELLANEOUS DETENTION TOILET ACCESSORIES

A. Materials:

1. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666 or ASTM A 240/A 240M, austenitic stainless steel, Type 304.

B. Stainless-Steel Finish:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.

a. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
b. Directional Satin Finish: No. 4.

2.2 DETENTION MIRRORS

A. Small, Framed Detention Mirror: Formed from 0.038-inch-(0.95-mm-) thick, stainless-steel sheet with fiberboard backing; enclosed in a frame formed from 0.064-inch (1.63-mm) nominal-thickness, zinc-plated steel sheet; with round corners. Fabricate frame with welded and ground corners or from one piece of metal.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include the following:

a. Brey-Krause Manufacturing Co; Security Mirror, T-8014-SS.
b. Maximum Security Products Corp; Model SM 990.
c. Midwest Portland LLC; Small Two-Piece Security Mirror, Model PH715.
d. PSI LLC; Small Detention Mirror, Model M-621.
e. Sweeper Metal Fabricators Corp; Standard Security Mirror, No. 6225Sm.

2. Size: Approximately 9-1/2 by 11 inches (241 by 279 mm).
3. Mounting: Front mounting with security fasteners to 0.168-inch (4.27-mm) nominal-thickness, metallic-coated steel mounting plate.
4. Substitutions: allowed subject to compliance with Division 01 requirements.

B. Materials:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, CS (Commercial Steel), Type B; suitable for exposed applications.
2. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, CS (Commercial Steel), Type B; with G60 (Z180) zinc (galvanized) coating designation.
3. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666 or ASTM A 240/A 240M, austenitic stainless steel, Type 304.

C. Finishes:

1. Stainless-Steel Finish:

a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
b. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
2) Mirrorlike Reflective, Nondirectional Polish: No. 8.

2. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

2.3 DETENTION GRAB BARS

A. Grab Bars: 1-1/2 inches (38.1 mm) in diameter; anti-ligature type, formed from 0.038-inch-(0.95-mm-) thick, stainless-steel tubing, with 3-inch-(76.2-mm-) diameter flanges formed from (0.125-inch-) 3.18-mm- thick, stainless steel. Closure plates formed from 0.125-inch-(3.18-mm-) thick, stainless steel. All-welded construction.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include the following:

a. AJW Architectural Products; US130.
b. American Specialties, Inc; 165.
c. Bradley Corporation; SA70 Series.
d. Brey-Krause Manufacturing Co; Security Grab Bar with Closure Plate, D-7216-SEC.
e. GAMCO Specialty Accessories; a division of Bobrick; MSA-14.
f. PSI LLC; GB-600.

2. Length: As indicated on Drawings.
3. Mounting: Front mounting with security fasteners.
4. Substitutions: allowed subject to compliance with Division 01 requirements.

B. Materials:

1. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666 or ASTM A 240/A 240M, austenitic stainless steel, Type 304.
2. Stainless-Steel Tubing: ASTM A 1016 /A 1016M-08, austenitic stainless steel, Type 304, seamless.

C. Stainless-Steel Finish:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches.

    a. Run grain of directional finishes with long dimension of each piece.
    b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
    c. Directional Satin Finish: No. 4.

2.4 FABRICATION

A. Coordinate dimensions and attachment methods of detention toilet accessories with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.

B. Shear and punch metals cleanly and accurately. Remove burrs.

C. Form edges and corners to be free of sharp edges and rough areas. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch-(12.7-mm-) wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch (0.8 mm) and support with concealed stiffeners.

D. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Weld corners and seams continuously to comply with referenced AWS standard and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
5. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure detention toilet accessories rigidly in place and

to support expected loads. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce formed-metal units as needed to attach and support other construction.

G. Cut, reinforce, drill, and tap detention toilet accessories to receive hardware, security fasteners, and similar items.

H. Form exposed work true to line and level with accurate angles and surfaces. Grind off and ease edges unless otherwise indicated.

I. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed security fasteners of type indicated or, if not indicated, flat-head (countersunk) security fasteners. Locate joints where least conspicuous.

2.5 SECURITY FASTENERS

A. Operable only by tools produced by fastener manufacturer or other licensed fabricator for use on specific type of fastener. Drive-system type, head style, material, and protective coating as required for assembly, installation, and strength, and as follows:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Acument Global Technologies; Acument Intellectual Properties, LLC.
    b. Bryce Fastener.
    c. Safety Socket LLC.
    d. Tamper-Pruf Screws.

2. Drive-System Type: Pinned Torx-Plus.
3. Fastener Strength: 120,000 psi (827 MPa).
4. Socket Button Head Fasteners:

    a. Heat-treated alloy steel, ASTM F 835 (ASTM F 835M).
    b. Stainless steel, ASTM F 879 (ASTM F 879M), Group 1 CW.

5. Socket Flat Countersunk Head Fasteners:

    a. Heat-treated alloy steel, ASTM F 835 (ASTM F 835M).
    b. Stainless steel, ASTM F 879 (ASTM F 879M), Group 1 CW.

6. Socket Head Cap Fasteners:

    a. Heat-treated alloy steel, ASTM A 574 (ASTM A 574M).
    b. Stainless steel, ASTM F 837 (ASTM F 837M), Group 1 CW.

7. Protective Coatings for Heat-Treated Alloy Steel:

    a. Zinc and clear trivalent chromium where indicated.

b. Zinc phosphate with oil, ASTM F 1137, Grade I, or black oxide unless otherwise indicated.

2.6 ACCESSORIES

A. Concealed Bolts: ASTM A 307, Grade A unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of detention toilet accessories.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of detention toilet accessories.

B. Verify locations of detention toilet accessories.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing detention toilet accessories to in-place construction. Include threaded fasteners for concrete and masonry inserts, security fasteners, and other connectors.

B. Provide temporary bracing or anchors in formwork for items that are to be built into masonry or similar construction.

C. Security Fasteners: Install detention toilet accessories using security fasteners with head style appropriate for installation requirements, strength, and finish of adjacent materials. Provide stainless-steel security fasteners in stainless-steel materials.

END OF SECTION 102813.63

SECTION 104413 - FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:

a. Portable fire extinguishers.

B. Related Requirements:

1. Section 104416 "Fire Extinguishers."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semi-recessed-, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semi-recessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.6 SEQUENCING

A. Apply decals on field-painted fire-protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Products: Subject to compliance with requirements,

a. Fire End & Croker Corporation.
b. J. L. Industries, Inc., a division of Activar Construction Products Group.
c. Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
d. Larsen's Manufacturing Company.
e. Modern Metal Products, Division of Technico Inc..
f. Moon-American.
g. Potter Roemer LLC
h. Watrous Division, American Specialties, Inc.
i. Substitutions: allowed subject to compliance with Division 01 requirements.

B. Cabinet Construction: Nonrated.

C. Semi-recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch (32- to 38-mm) backbend depth.

D. Cabinet Trim Material: Same material and finish as door.

E. Door Style: Solid opaque panel with frame.

F. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide manufacturer's standard.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

G. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
3. Door Lock: Cylinder lock, keyed alike to other cabinets.

2.3 SECURITY FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

B. Cabinet Construction: 1-hour fire rated.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls lined with minimum 5/8-inch-(16-mm-) thick fire-barrier material.

C. Cabinet Material: 0.097-inch-(2.45-mm-) thick steel sheet.

1. Shelf: Same metal and finish as cabinet.

D. Recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Rolled-Edge Trim: 2-1/2-inch (64-mm) backbend depth.

E. Cabinet Trim Material: Same material and finish as door.

F. Door Material: 0.097-inch-(2.45-mm-) thick steel sheet.

G. Door Style: Solid opaque panel with frame.

H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated, and as follows:

1. Recessed door pull.
2. Continuous Hinge: Same material and finish as trim, permitting door to open 180 degrees.
3. Mechanical Snap latch: Automatic snap latch when closed; latch bolt retracted by five-tumbler paracentric cylinder; keyed one side.

a. Lockbolt: 1 inch high by 7/16-inch (25 mm high by 11 mm) thick; 5/16-inch (8-mm) throw.

I. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to security fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Keys: Three per door lock.

J. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

    a. Finish: Baked enamel or powder coat.
    b. Color: As selected by Architect from full range of industry colors.

2.4 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.
4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semi-recessed and recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated

1. Fire-Protection Cabinets: 27-inches above finish floor to bottom edge of cabinet.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semi-recessed fire-protection cabinets.
2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Identification: Apply decals at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 10 44 16 – FIRE EXTINGUISHERS

1. GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 WORK INCLUDES

A. Base Bid
   1. Contractor Provide portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Requirements:

   1. Section 10 44 13 "Fire Protection Cabinets."

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

   1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:

      a. Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.7 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

2. PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Amerex Corporation.
b. Ansul Incorporated.
c. Badger Fire Protection.
d. Buckeye Fire Equipment Company.
e. Fire End & Croker Corporation.
f. Guardian Fire Equipment, Inc.
g. JL Industries, Inc.; a division of the Activar Construction Products Group.
h. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.

i. Larsens Manufacturing Company.
j. Moon American.
k. Nystrom Building Products.
l. Pem All Fire Extinguisher Corp.
m. Potter Roemer LLC.
n. Pyro-Chem; Tyco Safety Products.
o. Strike First Corporation of America.

2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
a. Orientation: Vertical.

3. EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: 54-inches (1372 mm) above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10 44 16

SECTION 10 51 13 – WELDED METAL LOCKERS (DUTY LOCKER WITH BUILT-IN BENCH DRAWER, PERSONAL STORAGE LOCKERS, PROPERTY LOCKERS, EVIDENCE LOCKERS AND HANDGUN LOCKERS)

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

Duty Lockers with built-in external bench drawer, Evidence Lockers, Personal Storage Lockers, Property Lockers and Wall Mounted Handgun Lockers.

B. Related Work, Not Furnished:

1. Finish floor covering material and installation.

1.2 DESCRIPTION

A. Finishes:

Fabricated Metal Components and Assemblies: All components to be painted with an electro-statically applied Powder Coat paint that can meet or exceed test requirements set out by ASTM standard D3451-06 Standard Guide for Testing Coating Powders and Powder Coatings.

B. Sizes:

Duty Lockers with built-in bench drawers: height is 84 inches; built-in bench drawer height is 18 inches; depth is 37.125 inches: width is 24 inches. The sloped top adds 8 inches to height.

Personal Storage Lockers (2 tier): height is 72 inches; base height is 4 inches; depth is 12 inches; width is 12 inches. See elevation drawing for opening information.

Property Lockers: height is 72 inches; base height is 4 inches; depth is 24 inches; width is 12 and 18 inches. See elevation drawing for opening information.

Evidence Lockers Pass-Thru: height is 82 inches; depth is 24 inches; width is 36 and 24 inches.

Handgun Locker: height is 26 1/8 inches; depth is 6 1/2 inches; width is 25 inches.

1.3 PERFORMANCE REQUIREMENTS

A. Design Requirements:

Limit overall width not to exceed specified nominal width; locker width designed for zero growth.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product literature and installation instructions for each type of welded metal locker required. Include data substantiating that products to be furnished comply with requirements of the contract documents.

B. Shop Drawings: Show fabrication, assembly, and installation details, including descriptions of procedures and diagrams. Show complete locker installation layout, including quantities, locations and types of accessory units required. Include notations and descriptions of all installation items and components.

C. Selection Samples: For initial selection of colors and textures, submit manufacturer's color charts, showing full range of colors and textures available.

D. Warranty: Submit draft copy of proposed warranty for review.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engage an experienced manufacturer who is ISO 9001 certified for the design, production, installation and service of welded metal lockers. Furnish certification attesting ISO 9001 quality system registration.

B. Installer Qualifications: Engage an experienced installer who is the manufacturer's authorized representative for the specified products for installing welded metal lockers.

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN

A. Manufacturer:

1. Basis of Design: Spacesaver by Bradford Systems, 430 Country Club Drive, Bensenville, IL (636-343-2336) is specified to establish desired quality and performance of work.

B. Acceptable manufacturer’s:

1. Bradford Systems
2. Norix
3. Kryptomax
4. Substitutions allowed subject to compliance with Division 01 requirements.

2.2 DUTY LOCKER WITH BUILT-IN BENCH DRAWER

A. Welded Frame:

1. The welded frame must consist of top, bottom, back, and sides constructed of a minimum of 18-gauge steel. All frame components shall be joined using resistance welding. Riveting of structural members will not be permitted.
2. Horizontal front flanges will be a minimum of 2 inches. Vertical front flanges will be a minimum of 1 inch. Horizontal and vertical flanges will overlap and be secured with a minimum two (2) resistance welds per corner.
3. Corner gussets shall be MIG and spot welded in each of the four front corners of the locker for increased stiffness and rigidity.
4. Provide side panel lances evenly spaced on 3-inch centers. Lances to provide the flexibility of on-site, end-user reconfiguration/addition of internal components anytime, anywhere, now or in the future.
5. Bench Housing for built-in bench drawer
6. Welded frame construction shall consist of top, bottom, and side components joined by using resistance welding. Riveting of bench housing structural members will not be permitted.
7. Corner gussets shall be welded in the two (2) front bottom corners of the bench housing for increased stiffness and rigidity.
8. Horizontal front flanges will be a minimum of 1 inch.
9. Vertical front flanges will be a minimum of 1 inch.
10. Horizontal and Vertical front flanges will overlap and shall be secured with minimum of one (1) resistance weld per corner.
11. Side panels – Lances symmetric and evenly spaced to provide optimum component locations (standard based on 3 inch on center vertical placement to match mating locker lance design).
12. Return flanges on housing to securely fasten housing to welded frame of locker.
13. Base of bench housing shall include four (4) 3/8”-16 UNC threaded weld-nuts and corresponding leveling feet.
14. Top of bench housing shall include hole pattern for mating bench seat.
15. Sides of bench housing shall include mounting holes in the event lockers are ganged together.
16. Lockers with built-in bench drawer and built-in external access drawer shall have intermediate base shelf with interlocking mechanism for securing drawer when locker door is closed.
17. Provide four (4) 0.875-inch diameter electrical knock-outs per locker, two (2) located on top of the locker in both right and left rear corners, and two (2) located in the back of locker centered at a distance no greater than [24] inches from the top and bottom. Knockouts allow end-user flexibility of adding electrical capability to lockers.
18. Lockers shall be prepared with mounting holes for use with the continuous sloped top system.

19. Lockers shall be prepared with mounting holes for attaching necessary trim components.
20. Locker shall be prepared with mounting holes for ganging lockers back-to-back or side-by-side.
21. Base of lockers shall include four (4) 3/8”-16 UNC threaded weld-nuts and corresponding leveling feet.
22. End/Back Panels: End/Back Panels with no exposed fasteners shall be provided on the exposed end or back of each locker run; thus, providing a clean and aesthetically pleasing appearance.

B. Ventilation:

1. Provide ventilation holes in top of locker to allow mechanically extracted air to be pulled up through the locker system as required. Ventilation shall be controlled by eight (8) evenly spaced 0.625-inch diameter holes.
2. Provide an adjustable air baffle for system balancing when mechanical air extraction is used. Upon balancing system, air baffle shall be secured with a fastener to maintain ventilation setting.
3. Provide louvered air vents in bottom of the main locker door/s to allow mechanically extracted air to be pulled up through the locker system.
4. Provide louvered air vents in drawer front when built-in bench drawer or built-in external access drawer models are required.
5. Minimum 0.500-inch gap between back of shelving components and back of locker to provide uninterrupted air flow up the rear of the locker system.
6. Minimum 2.00 inches gap between front of shelving and locker door to provide uninterrupted air flow up the front of the locker system.
7. Upon request manufacturer shall provide HVAC tech data to serve as a guideline for the Contractor.

C. Drawers (for bench drawer):

1. Drawer body wrapper shall have welded frame construction. Riveting of structural members will not be permitted.
2. Drawers for locker with built-in bench drawers and built-in external access drawers shall have box-formed drawer front.
3. Provide interlock system for securing drawer when main locker doors are closed and provide access only when main locker door/s is opened.
4. Built-in bench drawer shall have a nominal [36] inches in depth.
5. Provide a flush mounted pull handle.
6. Drawer Slides: Provide 200 lbs. maximum load capacity and pass 50,000 cycle performance testing (Max. load, uniform distribution) (Test data to be provided by manufacturer upon request)
7. Bench drawer minimum 26.5 inches drawer extension

8. Provide louvered air vents in drawer front when built-in bench drawer or built-in external access drawer models are required.

D. Bench Seat:

1. Provide 9.0 inches deep laminated kiln dried maple bench seat; material thickness 1.25 inches.
2. Front (leading edge) of bench seat to have 0.625-inch radius bull nose.
3. Finish of bench seat shall be sanded smooth and have two (2) coats of catalyzed varnish applied.

E. Single-Piece Welded Doors

1. Shall be formed from two (2) pieces of minimum 18-gauge cold rolled steel box formed and welded together using modern GMAW techniques. Single-piece door with inner and outer door panels shall have a combined steel thickness of no less than 0.096 inches thick. Welded door design with inner panel optimizes structural integrity of locker door system over and above any single frame door design.
2. Exterior door panel shall be constructed with formed flanges and return flanges to add stiffness.
3. Internal door panel shall be constructed with formed flanges for added stiffness.
4. All inner door panel (except Multi-Tier) heights shall be minimum 70% of external door height.
5. Single-piece welded door frame shall consist of internal door panel nested inside exterior door panel and welded per the following requirements:
6. Top / bottom. Exterior and Interior panels to be welded in a minimum of three (3) places with weld spacing not to exceed 6 inches between adjacent welds and 1 inch from any corner.
7. Sides. Exterior and interior panels to be welded with spacing not to exceed 12 inches between adjacent welds and 1 inch from any corner.
8. Inner door panel to have peg board style hole pattern, allowing the attachment of Document Holder and any standard peg board accessory.
9. Inner door panel to have 4-inch rectangular slot centered towards the top of the locker.
10. External door panel shall have louvers to provide adequate air circulation throughout locker system.
11. Louvered air vents shall be located at the bottom of the locker door to enhance circulation of mechanically extracted air from the bottom of the locker out of the top.
12. Louvered air vents shall be approximately 3 inches in width and 0.75 inches or in height and spaced on 1-inch centers.
13. All doors shall have neoprene silencers on each door for noise reduction.

14. Door torsional deflection shall not exceed 0.1875 inch with a 20 lb. point load. (Test data to be provided by manufacturer upon request)
15. Provide 16-gauge full length hinge for increased strength and security of locker system.
16. Hinges to be welded to door frame with spot welds not to exceed 6 inch or separation.
17. Door assembly to be riveted to door frame on factory pre-established hole pattern.
18. Provide Padlock hasp only. Pad locks to be provided by client.

F. Interior/Accessory components:

1. All interior components must be constructed of minimum 18-gauge steel (unless otherwise clarified in specification).
2. For added security, internal component can be secured utilizing blind rivets, threaded fasteners, or bending specially designed tab.
3. All interior components available at time of order and as post-installation upgrades in the future.
4. Provide Shelf with integral hanger bracket.
    1) Size specified by locker width.
    2) Hanger bracket designed with perforations on approximately 3-inch centers to insure clothing separation for optimum ventilation
    3) Performance: Uniform load rating 300 lbs.
    b. Shelf rear return flange stops minimum 0.50 inch short of locker back panel on order to allow air circulation throughout entire locker assembly.
    c. All performance test data shall be provided by manufacturer upon request.
5. Provide Boot Tray for Bench Drawer Model
    a. Material – Rubber
    b. Dimensions:
        1) Width – 12.90 inches
        2) Depth – 19.90 inches
        3) Height – 1.25 inches
    c. Manufactured from Natural rubber compounds, environmentally friendly, durable, water repellant easily cleaned with soap and water, resistant to alkalis and weak acids, mold, mildew, and dust mites.
6. Provide Body Armor Drying Rack for Bench Drawer Model
    a. Size of tray is controlled by locker width.
    b. Bottom of drying tray shall have louvered pattern to provide air circulation throughout

c. Shall have the ability to adjust/glide frontward and backward, while mounted in the bench drawer.

G. Locker Tag Numbers

1. Shall provide locker numbers on each locker per customer requirement.

H. Accessories:

1. Provide Trim and Fillers: Provide manufacturer’s standard.
2. Provide Continuous Sloped Tops: Provide manufacturers standard.

2.3 PERSONAL STORAGE LOCKERS

A. Material:

1. All major steel parts shall be made of mild cold rolled steel, free from imperfections and capable of taking a high-grade enamel finish.
2. Surfaces of the steel shall be thoroughly cleaned and phosphatized in a seven-stage process. All parts shall then be finished with a heavy coat of enamel baked on at 300 degrees for 30 minutes.
3. Lockers shall be built on the unit principle - each locker shall have an individual door and frame, an individual top, bottom, back and shelves with common intermediate uprights separating units.
4. The body of the locker consists of 24-gauge upright sheets, backs, tops, bottoms and shelves. Tops, bottoms and shelves are flanged on all four sides; backs are flanged on two sides. Uprights shall be offset at the front and flanged at the rear to provide a double lapped rear corner. All bolts and nuts shall be zinc plated.

B. Doors:

1. Door frames shall be 16 gauge and formed into 1" wide face channel shapes with a continuous vertical door strike, integral with the frame on both sides of the door opening. Double, triple or four tier locker cross frame members shall be 16-gauge channel shaped securely welded to vertical framing members to ensure a square and rigid assembly. Intermediate cross frame members are not required on box lockers. Surfaces of the steel shall be thoroughly cleaned and phosphatized in a seven-stage process. All parts shall then be finished with a heavy coat of enamel baked on at 300 degrees for 30 minutes.
2. Doors shall be 16 gauge, formed with a full channel shape on the lock side to fully conceal the lock bar, channel formation on the hinge side and right-angle formation across the top and bottom. Single tier doors 60" and 72" in height and 18" and wider shall have a diagonal reinforcing angle welded to inner surface. Locker doors shall be ventilated by louvers on the face of each door, top and bottom.
3. All "tiered" lockers shall be equipped with a positive automatic pre-locking device, whereby the locker may be locked while door is open and then closed without unlocking and without damaging locking mechanism.

C. Handles/Hinges:

1. A non-protruding 14 gauge lifting trigger and slide plate shall transfer the lifting force for actuating the lock bar when opening the door. The exposed portion of the lifting trigger shall be encased in a molded ABS thermoplastic cover that provides isolation from metal-to-metal contact and be contained in a formed 20-gauge stainless steel recessed pocket. This stainless-steel pocket shall contain a recessed area for the various lock types available and a mounting area for the number plate.
2. Hinges shall be 2" high, 5-knuckle, full loop, tight pin style, securely welded to frame and double riveted to the inside of the door flange. Locker doors 42" high and less shall have two hinges. Doors over 42" high shall have three hinges.
3. Latching shall be a one-piece, pre-lubricated spring steel latch, completely contained within the lock bar under tension to provide rattle-free operation. The lock bar shall be of pre-coated, double-channel steel construction. The lock bar shall be securely contained in the door channel by self-lubricating polyethylene guides that isolate the lock bar from metal-to-metal contact with the door. There shall be three latching points for lockers over 42" in height and two latching points for all tiered lockers 42" and under in height. The lock bar travel is limited by contacting resilient high-quality elastomeric cushioning devices concealed inside the lock bar. Frame hooks to accept latching shall be of heavy gauge steel, set close in and welded to the door frame. Continuous vertical door strike shall protect frame hooks from door slam damage. A soft rubber silencer shall be securely installed on each frame hook to absorb the impact caused by closing the door. Box locker doors shall be equipped with a padlock hasp and a stainless-steel strike plate with an integral handle pull.

D. Locker Tag Numbers

1. Provide locker numbers on each locker per customer requirement.

E. Accessories:

1. Trim and Fillers: Provide manufacturer’s standard.

2.4 PROPERTY LOCKERS

A. Welded Frame:

1. The welded frame must consist of top, bottom, back, and sides constructed of a minimum of 18-gauge steel. All frame components shall be joined using resistance welding. Riveting of structural members will not be permitted.
2. Horizontal front flanges will be a minimum of 2 inches. Vertical front flanges will be a minimum of 1 inch. Horizontal and vertical flanges will overlap and be secured with a minimum two (2) resistance welds per corner.
3. Corner gussets shall be MIG and spot welded in each of the four front corners of the locker for increased stiffness and rigidity.

4. Provide side panel lances evenly spaced on 3-inch centers. Lances to provide the flexibility of on-site, end-user reconfiguration/addition of internal components anytime, anywhere, now or in the future.
5. Lockers shall be prepared with mounting holes for attaching necessary trim components.
6. Locker shall be prepared with mounting holes for ganging lockers back-to-back or side-by-side.
7. Base of lockers shall include four (4) 3/8”-16 UNC threaded weld-nuts and corresponding leveling feet.
8. End Panels: End Panels with no exposed fasteners shall be provided on the end of each locker run; thus, providing a clean and aesthetically pleasing appearance.

B. Single-Piece Welded Doors:

1. Shall be formed from two (2) pieces of minimum 18-gauge cold rolled steel box formed and welded together using modern GMAW techniques. Single-piece door with inner and outer door panels shall have a combined steel thickness of no less than 0.096 inches thick. Welded door design with inner panel optimizes structural integrity of locker door system over and above any single frame door design.
2. Exterior door panel shall be constructed with formed flanges and return flanges to add stiffness.
3. Internal door panel shall be constructed with formed flanges for added stiffness.
4. Multi-Tier inner door panels shall be full height.
5. Single-piece welded door frame shall consist of internal door panel nested inside exterior door panel and welded per the following requirements:
6. Top / bottom. Exterior and Interior panels to be welded in a minimum of three (3) places with weld spacing not to exceed 6 inches between adjacent welds and 1 inch from any corner.
7. Sides. Exterior and interior panels to be welded with spacing not to exceed 12 inches between adjacent welds and 1 inch from any corner.
8. Inner door panel to have peg board style hole pattern, allowing the attachment of Document Holder and any standard peg board accessory.
9. All doors shall have neoprene silencers on each door for noise reduction.
10. Provide Diamond Perforated Pattern on all doors.
11. Door designs shall be in diamond perforated pattern.
12. Pattern is defined as 0.875 by 0.875-inch diamond perforations on 1.768-inch centers
13. Door torsional deflection shall not exceed 0.1875 inch with a 20 lb. point load. (Test data to be provided by manufacturer upon request)

14. Provide 16-gauge full length hinge for increased strength and security of locker system.
15. Hinges to be welded to door frame with spot welds not to exceed 6 inch or separation.
16. Door assembly to be riveted to door frame on factory pre-established hole pattern.
17. Provide Key Locks.

C. Locker Tag Numbers

1. Provide locker numbers on each locker per customer requirement.

D. Accessories:

1. Trim and Fillers: Provide manufacturer's standard.

2.5 EVIDENCE LOCKERS

A. Welded Frame:

1. The welded frame is structural and shall consist of top, bottom, back and sides constructed of a minimum of 18-gauge steel. All frame components shall be joined using resistance welding. Riveting or bolting of structural members will not be permitted.
2. Horizontal and vertical outer front flanges will be a minimum of 1.5 inches. Horizontal and vertical flanges will overlap with a minimum of 2 resistance welds per corner.
3. Center vertical lock housing is structural and will run the full height and depth of the locker. All locks will be completely enclosed by a full height removable panel. Pass-thru rear release mechanisms will be completely enclosed by the lock housing and accessible only when the rear door is open. Provide engagement points for the anti-pry tabs that are on all front doors.
4. Exposed lock mechanisms that can snag evidence and be obstructed by stored articles will not be permitted.

B. Welded Bases:

1. Each welded base shall be permanently affixed to each locker using modern Inert Gas Metal Arc Welding techniques for lateral unit stability. The base shall be a minimum of 14-gauge steel 4 inches high with a 1.5-inch return on the bottom for support.
2. Provide four 0.375-inch mounting holes and four 0.375 inch nuts welded in place for the mounting of floor levelers. Provide four appliance levelers per locker.
3. Provide removable access panels for access to mounting holes and leveling points.

C. Shelves:

1. Shall be a single-piece formed from a minimum of 18-gage cold rolled steel with a double 90-degree bend on the rear of the shelf and a double 90-degree bend on the front of the shelf. Shelf sides shall be turned up 90-degrees for ease of cleaning and to prevent debris from becoming caught between the shelf and the sidewall.
2. All shelves shall be welded into place. Rivets, screws, bolts or other loose fasteners will not be permitted for the fastening of shelves to the locker frame.

D. Locks:

1. Patent Pending. Lock shall be push button locking with a stainless steel push button and alignment bezel. Locks shall be a one-piece removable design. Locks will secure the door with the single push of a button with no other action required by the user.
2. Locks will be deadbolt type locks with multi-point engagement. Rotary latches or cam locks will not be tolerated.
3. Pass-thru locks will be reset from the rear of the locker when the rear door is in the open position only.
4. Provide documentation for cycle testing where locks are tested successfully to a minimum 40,000 cycles without failure.
5. Locks shall be pre-lubricated with no maintenance required for the lifetime of the unit (estimated at 20 years).

E. One Piece Welded Doors:

1. Shall be formed from two pieces of minimum 18-gauge cold rolled steel box formed and welded together using modern GMAW techniques. The one-piece door with inner and outer door skins shall have a combined steel thickness of no less than 0.096 inches thick.
2. Each door shall have a nickel plated, flush mounted door handle installed with fasteners visible only in the unlocked position.
3. Provide neoprene silencers on each door.
4. Provide anti-pry tabs that engage with the Center Vertical Lock Housing when the door is locked.
5. Doors shall have no moving parts except the door and the hinge.
6. Provide stainless-steel spring-loaded hinges that are welded to prevent pin removal. Spring loaded hinges shall be capable of holding the door closed and flush with the door frame. Doors that hang ajar are a safety concern and will not be tolerated.

F. Rear Doors

1. Shall be formed from two pieces of minimum 18-gauge cold rolled steel box formed and welded together using modern Inert Gas Metal Arc Welding techniques. The one-piece door with inner and outer door skins shall have a combined steel thickness of no less than 0.096 inches thick.

2. Each locker module shall have one rear door each and allow evidence to be removed from all compartments at once. Door design shall be in diamond perforated pattern.
3. Each rear door shall have multi-point engagement with a built-in L handle lock. Access to all lock mechanisms shall be hidden behind cover plates that are secured with tamperproof fasteners.

G. Refrigerator Insert:

1. Available with 2 compartments each individually locking without keys.
2. Factory installed into a standard evidence locker.
3. Pass-thru is emptied and reset from the rear at the push of a button.
4. Shall have a stainless-steel interior with spring loaded door hinges to hold each door closed.
5. Shall have magnetic seals on outer doors.
6. Shall have circulation fans that can maintain a consistent temperature throughout the interior of the fridge.
7. Shall have digital controls with settings preset to maintain 38º to 42º Fahrenheit.
8. Shall have an audible alarm.

H. Accessories:

1. Security mail slot: Provide manufacturer’s standard.
2. Mesh rear doors for Pass-Thru Lockers: Provide manufacturer’s standard.

2.6 HANDGUN LOCKERS

A. Welded Body:

1. The welded frame is structural and shall consist of top, bottom, back sides and intermediate partitions constructed of a minimum of 16-gauge steel. All frame components shall be joined using resistance welding. Riveting or bolting of structural members will not be permitted.

B. Trim:

1. Provide single piece formed .0598-inch, 16-gauge steel. Surround mounted to locker with steel rivets. Holes for fastening to the wall must accept a minimum 1/4 –inch diameter fastener.

C. Doors:

1. Shall be one-piece steel sheet, formed into Pan shape. Fabricate to prevent flexing when opening or closing and to swing open approximately 170 degrees. Sheet thickness .0478-inch, 18 gauge minimum. Provide bumpers for cushioning of door closing. Solid welded corners and polish smooth.

D. Hinges:

1. Steel, heavy duty, continuous, piano hinge 1.5-inch open, .062-inch thick, 1/8-inch pin, 1/2-inch knuckle: full height of door. One end of hinge welded to prevent the removal of the pin. Weld to door and attach to doorframe with factory-installed fasteners that are completely concealed and tamper resistant when door is closed.

E. Locks:

1. Tube locks keyed different with master keys supplied.

F. Hinges:

1. Number Plates: Manufacturer's standard etched, embossed, or engraved, plastic number plates with numerals at least 1/2-inch high. The numbering system shall be a three-digit number, sequenced as specified. Plates to be attached by (2) aluminum rivets and centered near the top on each door. Cushioning: 1/8-inch neoprene pad in bottom of openings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Follow manufacturer's written instructions for installation of each type of accessory item specified.

3.2 FIELD QUALITY CONTROL

A. Verify accessory unit alignment and plumb after installation. Correct if required, following manufacturer's instructions.

3.3 ADJUSTING

A. Adjust all accessories to provide smoothly operating, visually acceptable installation.

END OF SECTION 10 51 13

SECTION 12 24 13 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
2. Section 07 92 00 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples: For each exposed product and for each color and texture specified, 10 inches (250 mm) long.

D. Samples for Initial Selection: For each type and color of shadeband material.

1. Include Samples of accessories involving color selection.

E. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 10 inches (250 mm) square. Mark inside face of material if applicable.

F. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material, signed by product manufacturer.

C. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roller shades to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. BTX Window Automation, Inc.
2. DFB Sales.
3. Draper Inc.
4. Hunter Douglas Contract.
5. Lutron Electronics Co., Inc.
6. MechoShade Systems, Inc.
7. Nysan Solar Control Inc.; Hunter Douglas Company.
8. OEM Shades Inc.
9. Shade Techniques, LLC.
10. Silent Gliss USA, Inc.
11. SM Automatic, Inc.

B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Stainless steel.

a. Loop Length: Full length of roller shade.
b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: Chain tensioner, jamb mounted.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of inside face of shade or Left side of inside face of shade, as required to coordinate with existing conditions.
2. Direction of Shadeband Roll: Regular, from back of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

E. Shadebands:

1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material.
b. Color and Finish: As selected by Architect from manufacturer's full range.

F. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

a. Shape: L-shaped.
b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 3 inches (76 mm).

2. Endcap Covers: To cover exposed endcaps.
3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: Roller-shade manufacturer.
2. Type: Woven PVC-coated fiberglass and PVC-coated polyester.
3. Weave: Mesh.
4. Thickness: 0.026”-0.0283.
5. Weight: 14.6oz/yd^2
6. Openness Factor: 3 percent.
7. Color: As selected by Architect from manufacturer's full range.

2.4 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4-inch (6 mm) per side or 1/2-inch (13-mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).

C. Shade band Fabrication: Fabricate shade bands without battens or seams to extent possible except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions at all exterior window locations.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 12 24 13

SECTION 12 36 61.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid surface material countertops.
2. Solid surface material backsplashes.
3. Solid surface material end splashes.
4. Solid surface material apron fronts.
5. Solid surface material windowsills.

B. Related Requirements:

1. Section 22 40 00 "Plumbing Fixtures" for sinks and plumbing fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop and windowsill materials.

B. Shop Drawings: For countertops and windowsills. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples for Initial Selection: For each type of material exposed to view.

D. Samples for Verification: For the following products:

1. Countertop material, 6-inches (150 mm) square.
2. Windowsill material, 6-inches (150 mm) square.
3. One full-size solid surface material countertop, with front edge, 8 by 10-inches (200 by 250 mm), of construction and in configuration specified.
4. One full-size solid surface material windowsill, with front edge, 8 by 10-inches (200 by 250 mm), of construction and in configuration specified.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

1. Build mockup of typical countertop as shown on Drawings.
2. Build mockup of typical windowsill as shown on Drawings.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Field Measurements:
1. Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.
2. Verify dimensions of windowsills by field measurements after adjacent gypsum board walls are finished but before windowsill fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
1. Type: Provide Standard type unless Special Purpose type is indicated.
2. Colors and Patterns: As selected by Architect from manufacturer's full range.

B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions."

1. Grade: Custom.

B. Configuration:

1. Front: 1-1/2-inch (38-mm) laminated bullnose.
2. Backsplash: Straight, slightly eased at corner.
3. End Splash: Matching backsplash.

C. Countertops: 1/2-inch- (13-mm-) thick, solid surface material with front edge built up with same material.

D. Backsplashes: 1/2-inch- (13-mm-) thick, solid surface material.

E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.

F. Joints: Fabricate countertops without joints.

G. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

   a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16-inch (5 mm) into fixture opening.
   b. Provide vertical edges, rounded to 3/8-inch (10-mm) radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch (5 mm) into fixture opening.
   c. Provide 1-inch (25-mm) full bullnose edges projecting 3/8 inch (10 mm) into fixture opening.

2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 WINDOWSILL FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions.

1. Grade: Custom.

B. Configuration:

1. Front: 1-1/2-inch (38-mm) laminated bullnose.

C. Windowsills: 1/2-inch- (13-mm-) thick, solid surface material with front edge built up with same material.

D. Joints: Fabricate windowsills without joints.

2.4 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

B. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops and windowsills level to a tolerance of 1/8-inch in 8-feet (3 mm in 2.4 m), 1/4-inch (6 mm) maximum. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

C. Fasten sub-tops to cabinets by screwing through sub-tops into corner blocks of base cabinets. Shim as needed to align sub-tops in a level plane.

D. Secure countertops to sub-tops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned, and joints are of specified width.

F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in particleboard sub-tops by saturating with varnish.

I. Apply sealant to gaps at walls and adjacent substrates; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION 12 36 61.16

SECTION 12 48 16 - ENTRANCE FLOOR GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Recessed floor grilles and frames.

1.3 COORDINATION

A. Coordinate size and location of recesses in concrete to receive floor grilles and frames.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for entrance floor grilles and foot grilles.

B. Shop Drawings:

1. Items penetrating floor grilles and frames, including door control devices.
2. Perimeter floor moldings.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For floor grilles and frames to include in maintenance manuals.

1.6 FIELD CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated in the drawings or comparable product by one of the following:

1. Babcock-Davis.
2. Balco, Inc.
3. C/S Group.
4. JL Industries, Inc.; a division of the Activar Construction Products Group.
5. K. N. Crowder Manufacturing, Inc.
6. Kadee Industries, Inc.
7. Mats Incorporated.
8. McGill Architectural Products.
9. Pawling Corporation.
10. ProSpec; an Oldcastle company.
11. Reese Enterprises, Inc.

2.2 ENTRANCE FLOOR GRILLES, GENERAL

A. Structural Performance: Provide floor grilles and frames capable of withstanding the following loads and stresses:

1. Uniform floor load of 300 lbf/sq. ft. (14.36 kN/sq. m).
2. Wheel load of 350 lb (159 kg) per wheel.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1.

2.3 FLOOR GRILLES

A. General: Provide manufacturer's standard floor-grille assemblies consisting of treads of type and profile indicated, interlocked or joined together by cross members, and with support legs (if any) and other components needed to produce a complete installation.

B. Stainless-Steel Floor Grille: Type 304.

1. Surface Treads: 0.090-by-0.172-inch (2.2-by-4.37-mm) wire with 0.145-inch-(3.68-mm-) wide openings between wires.
2. Support Rods: Spaced 1 inch (25.4 mm) o.c., welded to each wire.
3. Mat Grating: 5/8 inch (15.8 mm) deep.
4. Stainless-Steel Finish: Mill.
5. Grille Size: As indicated.

2.4 FRAMES

A. Provide manufacturer's standard frames of size and style for grille type, for permanent recessed installation in subfloor, complete with installation anchorages and accessories. Unless otherwise indicated, fabricate frame of same material and finish as grilles.

2.5 DRAIN PANS

A. Provide manufacturer's standard, (0.060-inch-) 1.52-mm- thick, stainless-steel sheet drain pan with NPS 2 (DN 50) drain outlet for each floor-grille unit. Coat bottom of pan with protective coating recommended by manufacturer.

2.6 MATERIALS

A. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

B. Stainless-Steel Angles: ASTM A 276 or ASTM A 479/A 479M, corrosion resistant, Type 304.

2.7 FABRICATION

A. Shop fabricate floor grilles to the greatest extent possible in sizes as indicated. Unless otherwise indicated, provide each grille as a single unit; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in grilles are necessary, space symmetrically and away from normal traffic lanes.

B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

2.8 STAINLESS-STEEL FINISHES

A. Mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, size, minimum recess depth, and other conditions affecting installation of floor grilles and frames.

B. Examine roughing-in for drainage piping systems to verify actual locations of piping connections before floor grille and frame and drain pan installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install recessed floor grilles and frames and drain pans to comply with manufacturer's written instructions at locations indicated and with top of floor grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set floor-grille tops at height for most effective cleaning action. Coordinate top of floor-grille surfaces with doors that swing across grilles to provide clearance under door.

3.3 PROTECTION

A. After completing frame installations, provide temporary filler of plywood or fiberboard in floor-grille recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 124816

SECTION 125500 - DETENTION FURNITURE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Detention mattresses.
   2. Stools

B. Related Requirements:

   1. Section 087163 "Detention Door Hardware" for security key cabinets.
   2. Section 102813.63 "Detention Toilet Accessories" for detention toilet and bath accessories.

1.3 COORDINATION

A. Coordinate installation of anchorages for detention furniture. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in adjacent construction. Deliver such items to Project site in time for installation.

B. Coordinate size and location of recesses in wall construction to receive detention furniture.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include material descriptions, dimensions, individual material components and profiles.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Detention Mattresses: Deliver wrapped to provide protection during transit and Project-site storage. Protect from contact with moisture.

PART 2 - PRODUCTS

2.1 DETENTION MATTRESSES

A. General: Comply with 16 CFR 1633 and California Technical Bulletin 121 as determined by testing identical products by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BarkerBuilt, Division of Bob Barker Company, Inc; Fire-Seal.
b. Chestnut Ridge Foam, Inc; CR SAFGUARD.
c. Derby Industries; Derby Mattress.
d. UNICOR; Derby Mattress.

B. Core: Fire-resistive solid foam.

C. Cover Fabric: Vinyl bonded to nylon scrim; with a minimum total weight of 10 oz./sq. yd. (339 g/sq. m). Fabricate cover of four-corner box construction with seams facing inside of detention mattress except end closing seam located at foot of mattress; sew with nylon thread in a double-lock stitch.

D. Thickness: 4 inches (102 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, for compliance with requirements for installation tolerances and other conditions affecting performance.

INSTALLATION

B. Provide 10 detention mattresses.

END OF SECTION 125500

SECTION 21 05 00 - BASIC FIRE SUPPRESSION REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements applicable to all Division 21 Sections. Also refer to Division 01 - General Requirements.

B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

1.2 SCOPE OF WORK

A. This Specification and the associated drawings govern the furnishing, installing, testing and placing into satisfactory operation the Mechanical Systems.

B. Each Contractor shall provide all new materials indicated on the drawings and/or in these specifications, and all items required to make the portion of the Mechanical Work a finished and working system.

C. All work will be awarded under a single General Contract. The division of work listed below is for the Contractor's convenience and lists normal breakdown of the work.

D. Scope of Work:

1. Plumbing Work: Refer to Section 22 05 00 "Basic Plumbing Requirements".
2. Heating Work: Refer to Section 23 05 00 "Basic HVAC Requirements".
3. Air Conditioning and Ventilating Work: Refer to Section 23 05 00 "Basic HVAC Requirements".
4. Temperature Control Work: Refer to Section 23 05 00 "Basic HVAC Requirements".
5. Fire Protection Work shall include, but is not necessarily limited to:

    a. Furnish and install a new fire protection service to the building including backflow preventer as required by Code.
    b. Furnish and install all fire hydrants and associated piping, valves, and supports including connection to the water main.
    c. Furnish and install a complete wet pipe sprinkler system for areas noted on the drawings.
    d. Furnish and install a complete dry pipe sprinkler system for areas noted on the drawings.
    e. Furnish and install a complete fire valve/fire hose standpipe system.
    f. Furnish and install all items listed on the Fire Protection Material List.
    g. Furnish all hydraulic calculations and working sprinkler drawings.
    h. Furnish and install seismic restraint and equipment designed for use in seismic conditions described in Section 21 05 50.
    i. Furnish and install firestopping systems for penetrations of fire-rated construction associated with this Contractor's work.

j. Complete all applicable tests, certifications, forms, and matrices listed in the Illinois Department of Public Health (IDPH) Final Occupancy Checklist Certifications for Request of Inspection.

6. Testing, Adjusting, and Balancing Work: Refer to Section 23 05 00 "Basic HVAC Requirements".

1.3 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL & CONTROL CONTRACTORS

A. Definitions:

1. "Mechanical Contractors" refers to the following:

a. Plumbing Contractor.
b. Heating Contractor.
c. Air Conditioning and Ventilating Contractor.
d. Temperature Control Contractor.
e. Fire Protection Contractor.
f. Testing, Adjusting, and Balancing Contractor.

2. Motor Control Wiring: The wiring associated with the remote operation of the magnetic coils of magnetic motor starters or relays, or the wiring that permits direct cycling of motors by means of devices in series with the motor power wiring. In the latter case the devices are usually single phase and are usually connected to the motor power wiring through a manual motor starter having "Manual-Off-Auto" provisions.
3. Control devices such as start-stop push buttons, thermostats, pressure switches, flow switches, relays, etc., generally represent the types of equipment associated with motor control wiring.
4. Motor control wiring is single phase and usually 120 volts. In some instances, the voltage will be the same as the motor power wiring. Generally, where the motor power wiring exceeds 120 volts, a control transformer is used to give a control voltage of 120 volts.
5. Temperature Control Wiring: The wiring associated with the operation of a motorized damper, solenoid valve or motorized valve, etc., either modulating or two-position, as opposed to wiring which directly powers or controls a motor used to drive equipment such as fans, pumps, etc.

a. This wiring will be from a 120 volt source and may continue as 120 volt, or be reduced in voltage (24 volt) in which case a control transformer shall be furnished as part of the temperature control wiring.

6. Control Motor: An electric device used to operate dampers, valves, etc. It may be two-position or modulating. Conventional characteristics of such a motor are 24 volts, 60 cycles, 1 phase, although other voltages may be encountered.
7. Voltage is generally specified and scheduled as distribution voltage. Motor submittals may be based on utilization voltage if it corresponds to the correct distribution voltage.

Distribution/Nominal Voltage	Utilization Voltage
120	115
208	200
240	230
277	265
480	460

B. General:

1. The purpose of these Specifications is to outline the Electrical and Mechanical Contractor's responsibilities related to electrical work required for items such as temperature controls, mechanical equipment, fans, chillers, compressors and the like. The exact wiring requirements for much of the equipment cannot be determined until the systems have been selected and submittals reviewed. Therefore, the electrical drawings show only known wiring related to such items. All wiring not shown on the electrical drawings, but required for mechanical systems, is the responsibility of the Mechanical Contractor.
2. Where the drawings require the Electrical Contractor to wire between equipment furnished by the Mechanical Contractor, such wiring shall terminate at terminals provided in the equipment. The Mechanical Contractor shall provide complete electrical power/controls wiring diagrams and supervision to the Electrical Contractor and designate the terminal numbers for correct wiring.
3. All electrical work shall conform to the National Electrical Code. All provisions of the Electrical Specifications concerning wiring, protection, etc., apply to wiring provided by the Mechanical Contractor unless noted otherwise.
4. Control low (24V) and control line (120V) voltage wiring, conduit, and related switches and relays required for the automatic control and/or interlock of motors and equipment, including final connection, are to be furnished and installed under Divisions 21, 22 and 23. Materials and installation to conform to Class 1 or 2 requirements, California Electrical Code Article 725.
5. All Contractors shall establish utility elevations prior to fabrication and shall coordinate their material and equipment with other trades. When a conflict arises, priority is as follows:

    a. Light fixtures.
    b. Gravity flow piping, including steam and condensate.
    c. Electrical busduct.
    d. Sheet metal.
    e. Electrical cable trays, including access space.
    f. Sprinkler piping and other piping.
    g. Electrical conduits and wireway.

C. Mechanical Contractor's Responsibility:

1. Assumes responsibility for internal wiring of all equipment provided by the Mechanical Contractor, for example:

    a. Boiler Feed Pumps.
    b. Burners.

c. Chillers.
d. Computer Room Air Conditioning Units.
e. Condensate Return Stations.
f. Condensing Units.
g. Makeup Air Units.
h. Electric Humidifiers.
i. Gas Trains.
j. Package Air Handling Units.
k. Packaged Rooftop Units.

2. Assumes all responsibility for the Temperature Control wiring, when the Temperature Control Contractor is a Subcontractor to the Mechanical Contractor.
3. Shall verify all existing equipment sizes and capacities where units are to be modified, moved or replaced. Contractor shall notify Architect/Engineer of any discrepancies prior to ordering new units or replacement parts, including replacements of equipment motors.
4. Temperature Control Subcontractor's Responsibility:

   a. Wiring of all devices needed to make the Temperature Control System functional.
   b. Verifying any control wiring on the electrical drawings as being by the Electrical Contractor. All wiring required for the Control System, but not shown on the electrical drawings, is the responsibility of the Temperature Control Subcontractor.
   c. Coordinating equipment locations (such as relays, transformers, etc.) with the Electrical Contractor, where wiring of the equipment is by the Electrical Contractor.

5. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

D. Electrical Contractor's Responsibility:

1. Provides all combination starters, manual starters and disconnect devices shown on the Electrical Drawings or indicated to be by the Electrical Contractor on the Mechanical Drawings or Specifications.
2. Installs and wires all remote control devices furnished by the Mechanical Contractor or Temperature Control Subcontractor when so noted on the Electrical Drawings.
3. Provides motor control and temperature control wiring, where so noted on the drawings.
4. Coordinate with the Mechanical Contractor for size of motors and/or other electrical devices involved with repair or replacement of existing equipment.
5. Furnishes, installs and connects all relays, etc., for automatic shutdown of certain fans upon actuation of the Fire Alarm System as indicated and specified in Division 28.
6. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

1.4 COORDINATION DRAWINGS

A. Definitions:

1. Coordination Drawings: A compilation of the pertinent layout and system drawings that show the sizes and locations, including elevations, of system components and required access areas to ensure that no two objects will occupy the same space.

    a. Mechanical trades shall include, but are not limited to, mechanical equipment, ductwork, fire protection systems, plumbing piping, medical gas systems, hydronic piping, steam and steam condensate piping, and any item that may impact coordination with other disciplines.
    b. Electrical trades shall include, but are not limited to, electrical equipment, conduit 1.5" and larger, conduit racks, cable trays, pull boxes, transformers, raceway, busway, lighting, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
    c. Technology trades shall include, but are not limited to, technology equipment, racks, conduit 1.5" and larger, conduit racks, cable trays, ladder rack, pull boxes, raceway, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
    d. Maintenance clearances and code-required dedicated space shall be included.
    e. The coordination drawings shall include all underground, underfloor, in-floor, in chase, and vertical trade items.

2. Spaces with open/cloud ceiling architecture shall indicate the overhead utilities and locate equipment as required to maintain clearance above lights. The intent for the installation is to maintain a maximum allowable vertical clearance and an organized/clean manner in the horizontal. Notify Architect/Engineer of the maximum clearance which can be maintained. Failure to comply will result in modifications with no cost to Owner.

    a. In cloud ceiling architecture, when open cabling/wire and/or cable tray crosses gaps between ceiling clouds and/or walls, cabling is to transition to conduits to span the gaps in order to conceal cabling from below.

3. The contractors shall use the coordination process to identify the proper sequence of installation of all utilities above ceilings and in other congested areas, to ensure an orderly and coordinated end result, and to provide adequate access for service and maintenance.

B. Participation:

1. The contractors and subcontractors responsible for work defined above shall participate in the coordination drawing process.
2. One contractor shall be designated as the Coordinating Contractor for purposes of preparing a complete set of composite electronic CAD coordination drawings that include all applicable trades, and for coordinating the activities related to this process. The Coordinating Contractor for this project shall be the Mechanical Contractor.

a. The Coordinating Contractor shall utilize personnel familiar with requirements of this project and skilled as draftspersons/CAD operators, competent to prepare the required coordination drawings.

3. Electronic CAD drawings shall be submitted to the Coordinating Contractor for addition of work by other trades. IMEG will provide electronic file copies of applicable drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by IMEG. IMEG will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings.

C. Drawing Requirements:

1. The file format and file naming convention shall be coordinated with and agreed to by all contractors participating in the coordination process and the Owner.

a. Scale of drawings:

1) General plans: 1/4 Inch = 1 '-0" (minimum).
2) Mechanical, electrical, communication rooms, and including the surrounding areas within 10 feet: 1/2 Inch = 1'-0" (minimum).
3) Shafts and risers: 1/2 Inch = 1'-0" (minimum).
4) Sections of shafts and mechanical and electrical equipment rooms: 1/4 Inch = 1 '-0" (minimum).
5) Sections of congested areas: 1/2 Inch = 1'-0" (minimum).

2. Ductwork layout drawings shall be the baseline system for other components. Ductwork layout drawings shall be modified to accommodate other components as the coordination process progresses.
3. There may be more drawings required for risers, top and bottom levels of mechanical rooms, and shafts.
4. The minimum quantity of drawings will be established at the first coordination meeting and sent to the A/E for review. Additional drawings may be required if other areas of congestion are discovered during the coordination process.

D. General:

1. Coordination drawing files shall be made available to the A/E and Owner's Representative. The A/E will only review identified conflicts and give an opinion but will not perform as a coordinator.
2. A plotted set of coordination drawings shall be available at the project site.
3. Coordination drawings are not shop drawings and shall not be submitted as such.
4. The contract drawings are schematic in nature and do not show every fitting and appurtenance for each utility. Each contractor is expected to have included in the bid sufficient fittings, material, and labor to allow for adjustments in routing of utilities made necessary by the coordination process and to provide a complete and functional system.
5. The contractors will not be allowed additional costs or time extensions due to participation in the coordination process.

6. The contractors will not be allowed additional costs or time extensions for additional fittings, reroutings or changes of duct size, that are essentially equivalent sizes to those shown on the drawings and determined necessary through the coordination process.
7. The A/E reserves the right to determine space priority of equipment in the event of spatial conflicts or interference between equipment, piping, conduit, ducts, and equipment provided by the trades.
8. Changes to the contract documents that are necessary for systems installation and coordination shall be brought to the attention of the A/E.
9. Access panels shall preferably occur only in gypsum board walls or plaster ceilings where indicated on the drawings.

    a. Access to mechanical, electrical, technology, and other items located above the ceiling shall be through accessible lay-in ceiling tile areas.
    b. Potential layout changes shall be made to avoid additional access panels.
    c. Additional access panels shall not be allowed without written approval from the A/E at the coordination drawing stage.
    d. Providing additional access panels shall be considered after other alternatives are reviewed and discarded by the A/E and the Owner's Representative.
    e. When additional access panels are required, they shall be provided without additional cost to the Owner.

10. Complete the coordination drawing process and obtain sign off of the drawings by all contractors prior to installing any of the components.
11. Conflicts that result after the coordination drawings are signed off shall be the responsibility of the contractor or subcontractor who did not properly identify their work requirements or installed their work without proper coordination.
12. Updated coordination drawings that reflect as-built conditions may be used as record documents.

1.5 QUALITY ASSURANCE

A. Contractor's Responsibility Prior to Submitting Pricing Data:

1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guidelines, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Design Team any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Design Team will be done at the Contractor's risk.

B. Qualifications:

1. Only products of reputable manufacturers are acceptable.
2. All Contractors and subcontractors shall employ only workers skilled in their trades.

C. Compliance with Codes, Laws, Ordinances:

1. Conform to all requirements of the Caseyville, Illinois Codes, Laws, Ordinances and other regulations having jurisdiction.
2. Conform to all State Codes.
3. If there is a discrepancy between the codes and regulations and these specifications, the Architect/Engineer shall determine the method or equipment used.
4. If the Contractor notes, at the time of bidding, that any parts of the drawings or specifications do not comply with the codes or regulations, Contractor shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, Contractor shall submit with the proposal a separate price to make the system comply with the codes and regulations.
5. All changes to the system made after letting of the contract, to comply with codes or requirements of Inspectors, shall be made by the Contractor without cost to the Owner.
6. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.
7. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.

D. Permits, Fees, Taxes, Inspections:

1. Procure all applicable permits and licenses.
2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
3. Pay all charges for permits or licenses.
4. Pay all fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
5. Pay all charges arising out of required inspections by an authorized body.
6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
7. Where applicable, all fixtures, equipment and materials shall be approved or listed by Underwriter's Laboratories, Inc.

E. Utility Company Requirements:

1. Secure from the appropriate private or public utility company all applicable requirements.
2. Comply with all utility company requirements.
3. Make application for and pay for fire protection water service connection.

F. Examination of Drawings:

1. The drawings for the fire protection work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of pipes and ducts to best fit the layout of the job.
3. Scaling of the drawings is not sufficient or accurate for determining these locations.
4. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
5. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
6. If an item is either on the drawings or in the specifications, it shall be included in this contract.
7. Determination of quantities of material and equipment required shall be made by the Contractor from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater number shall govern.
8. Where used in fire protection documents, the word "furnish" shall mean supply for use, the word "install" shall mean connect complete and ready for operation, and the word "provide" shall mean to supply for use and connect complete and ready for operation.

    a. Any item listed as furnished shall also be installed, unless otherwise noted.
    b. Any item listed as installed shall also be furnished, unless otherwise noted.

G. Field Measurements:

1. Verify all pertinent dimensions at the job site before ordering any materials or fabricating any supports, pipes or ducts.

H. Electronic Media/Files:

1. Construction drawings for this project have been prepared utilizing Revit.
2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by IMEG.
4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.
5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
6. The drawings prepared by IMEG for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.

7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.
8. The information is provided to expedite the project and assist the Contractor with no guarantee by IMEG as to the accuracy or correctness of the information provided. IMEG accepts no responsibility or liability for the Contractor's use of these documents.

1.6 SUBMITTALS

A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

1. Submittals list:

Referenced Specification Section	Submittal Item
21 05 00	Owner Training Agenda
21 05 29	Hangers and Supports
21 05 48	Vibration Isolation Equipment
21 05 50	Seismic Restraint Systems
21 05 53	Mechanical Identification
21 13 00	Sprinkler Systems
21 13 00	Fire Protection Equipment

B. General Submittal Procedures: In addition to the provisions of Division 01, the following are required:

1. Transmittal: Each transmittal shall include the following:

a. Date
b. Project title and number
c. Contractor's name and address
d. Division of work (e.g., plumbing, heating, ventilating, etc.)
e. Description of items submitted and relevant specification number
f. Notations of deviations from the contract documents
g. Other pertinent data

2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:

a. Date
b. Project title and number
c. Architect/Engineer
d. Contractor and subcontractors' names and addresses
e. Supplier and manufacturer's names and addresses
f. Division of work (e.g., plumbing, heating, ventilating, etc.)
g. Description of item submitted (using project nomenclature) and relevant specification number
h. Notations of deviations from the contract documents
i. Other pertinent data
j. Provide space for Contractor's review stamps

3. Composition:

    a. Submittals shall be submitted using specification sections and the project nomenclature for each item.
    b. Individual submittal packages shall be prepared for items in each specification section. All items within a single specification section shall be packaged together where possible. An individual submittal may contain items from multiple specifications sections if the items are intimately linked (e.g., pumps and motors).
    c. All sets shall contain an index of the items enclosed with a general topic description on the cover.

4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; electrical power criteria (e.g., voltage, phase, amps, horsepower, kW, etc.) wiring and control diagrams; Short Circuit Current Rating (SCCR); dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
5. Contractor's Approval Stamp:

    a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
    b. Unstamped submittals will be rejected.
    c. The Contractor's review shall include, but not be limited to, verification of the following:

        1) Only approved manufacturers are used.
        2) Addenda items have been incorporated.
        3) Catalog numbers and options match those specified.
        4) Performance data matches that specified.
        5) Electrical characteristics and loads match those specified.
        6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
        7) Dimensions and service clearances are suitable for the intended location.
        8) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
        9) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).

    d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.

e. The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.

6. Submittal Identification and Markings:

   a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
   b. The Contractor shall clearly indicate the size, finish, material, etc.
   c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
   d. All marks and identifications on the submittals shall be unambiguous.

7. Schedule submittals to expedite the project. Coordinate submission of related items.
8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.
9. Reproduction of contract documents alone is not acceptable for submittals.
10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Architect/Engineer.
11. Submittals not required by the contract documents may be returned without review.
12. The Architect/Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Architect/Engineer to recheck and handle the additional shop drawing submittals.
13. Submittals shall be reviewed and approved by the Architect/Engineer **before** releasing any equipment for manufacture or shipment.
14. Contractor's responsibility for errors, omissions. or deviation from the contract documents in submittals is not relieved by the Architect/Engineer's approval.
15. Schedule shall allow for adequate time to perform orderly and proper review of submittals, including time for consultants and Owner if required, and resubmittals by Contractor if necessary, and to cause no delay in Work or in activities of Owner or other contractors.

    a. Allow at least two weeks for Architect's/Engineer's review and processing of each submittal.

16. Architect/Engineer reserves the right to withhold action on a submittal which, in the Architect/Engineer's opinion, requires coordination with other submittals until related submittals are received. The Architect/Engineer will notify the Contractor, in writing, when they exercise this right.

C. Electronic Submittal Procedures:

1. Distribution: Email submittals as attachments to all parties designated by the Architect/Engineer, unless a web-based submittal program is used.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. Submittal file name: 21 XX XX.description.YYYYMMDD
    b. Transmittal file name: 21 XX XX.description.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.

1.7 SCHEDULE OF VALUES

A. The requirements herein are in addition to the provisions of Division 01.

B. Format:

1. Use AIA Document Continuation Sheets G703 or another similar form approved by the Owner and Architect/Engineer.
2. Submit in Excel format.
3. Support values given with substantiating data.

C. Preparation:

1. Itemize work required by each specification section and list all providers. All work provided by subcontractors and major suppliers shall be listed on the Schedule of Values. List each subcontractor and supplier by company name.
2. Break down all costs into:

    a. Material: Delivered cost of product with taxes paid.
    b. Labor: Labor cost, excluding overhead and profit.

3. Itemize the cost for each of the following:

    a. Overhead and profit.
    b. Bonds.
    c. Insurance.
    d. General Requirements: Itemize all requirements.

4. For each line item having an installed cost of more than $5,000, break down costs to list major products or operations under each item. At a minimum, provide material and labor cost line items for the following:

a. Each piece of equipment requiring shop drawings (e.g., fire pump, double interlock pre-action system, backflow preventer, etc.) using the project nomenclature (FP-1, DIPS-1, BFP-1, etc.).
b. Each sprinkler zone. In addition, break down the material and labor based on geography (building, floor, wing and/or phase).
c. Each double interlock pre-action system.
d. Each clean agent fire suppression system.
e. Each wet agent fire suppression system.
f. Site utilities (5' beyond building)
g. Seismic design
h. Commissioning
i. Record drawings
j. Punchlist and closeout

D. Update Schedule of Values when:

1. Indicated by Architect/Engineer.
2. Change of subcontractor or supplier occurs.
3. Change of product or equipment occurs.

1.8 CHANGE ORDERS

A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders shall be broken down by sheet or associated individual line item indicated in the change associated narrative, whichever provides the most detailed breakdown. Change orders with inadequate breakdown will be rejected.

B. Itemized pricing with unit cost shall be provided from all distributors and associated subcontractors.

C. Change order work shall not proceed until authorized.

1.9 EQUIPMENT SUPPLIERS' INSPECTION

A. The following equipment shall not be placed in operation until a competent installation and service representative of the manufacturer has inspected the installation and certified that the equipment is properly installed, adjusted and lubricated; that preliminary operating instructions have been given; and that the equipment is ready for operation:

1. Fire Seal Systems

B. Contractor shall arrange for and obtain supplier's on-site inspection(s) at proper time(s) to assure each phase of equipment installation and/or connection is in accordance with the manufacturer's instructions.

C. Submit copies of start-up reports to the Architect/Engineer and include copies of Owner's Operation and Maintenance Manuals.

1.10 PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE

A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage. Keep materials clean, dry and free from harmful conditions. Immediately remove any materials that become wet or that are suspected of becoming contaminated with mold or other organisms.

B. Keep all bearings properly lubricated and all belts properly tensioned and aligned.

C. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Mechanical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.

D. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate the work with other trades.

1.11 NETWORK / INTERNET CONNECTED EQUIPMENT

A. These specifications may require certain equipment or systems to have network, Internet and/or remote access capability ("Network Capability"). Any requirement for Network Capability shall be interpreted only as a functional capability and is not to be construed as authority to connect or enable any Network Capability. Network Capability may only be connected or enabled with the express written consent of the Owner.

1.12 WARRANTY

A. Provide one-year warranty, unless otherwise noted, to the Owner for all fixtures, equipment, materials, and workmanship.

B. The warranty period for all work in this Division of the specifications shall commence on the date of final acceptance, unless a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.

C. Warranty requirements shall extend to correction, without cost to the Owner, of all Work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage resulting from defects or nonconformance with contract documents.

1.13 INSURANCE

A. Contractor shall maintain insurance coverage as set forth in Division 0 of these specifications.

1.14 MATERIAL SUBSTITUTION

A. Where several manufacturers' names are given, the scheduled manufacturer is the basis for job design and establishes the quality required.

B. Equivalent equipment manufactured by the other listed manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications and fits in the allocated space. When using other listed manufacturers, the Contractor shall assume responsibility for any and all modifications necessary (including, but not limited to structural supports, electrical connections, piping and ductwork connections and arrangement, plumbing connections and rough-in, and regulatory agency approval, etc.) and coordinate such with other contractors.

C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer not later than ten days prior to the bid opening.

D. This Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on the Contractors part or on the part of other Contractors whose work is affected.

E. This Contractor may list voluntary add or deduct prices for alternate materials on the bid form. These items will not be used in determining the low bidder.

F. All material substitutions requested later than ten (10) days prior to bid opening must be listed as voluntary changes on the bid form.

1.15 PROJECT COMMISSIONING

A. The Contractor shall work with the Commissioning Agent (CxA) as described in Section 01 91 00 and provide all services as described in the Commissioning Plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 JOBSITE SAFETY

A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or the employees and subconsultants at a construction site, shall relieve the Contractor and other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and personnel have no authority to exercise any control over any construction contractor or

other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.2 EXCAVATION, FILL, BACKFILL, COMPACTION

A. General:

1. Prior to the commencement of any excavation or digging, the Contractor shall verify all underground utilities with the regional utility locator. Provide prior notice to the locator before excavations. Contact information for most regional utility locaters can be found at the following website (https://call811.com/) or by calling 811.
2. The Contractor shall do all excavating, filling, backfilling and compacting associated with the work.

B. Excavation:

1. Make all excavations to accurate, solid, undisturbed earth, and to proper dimensions.
2. Where excavations are made in error below foundations, concrete of same strength as specified for the foundations or thoroughly compacted sand-gravel fill, as determined by the Architect/Engineer, shall be placed in such excess excavations. Place thoroughly compacted, clean, stable fill in excess excavations under slabs on grade, at the Contractor's expense.
3. Trim bottom and sides of excavations to grades required for foundations.
4. Protect excavations against frost and freezing.
5. Take care in excavating not to damage surrounding structures, equipment, or buried utilities. Do not undermine footing or foundation.
6. Perform all trenching in a manner to prevent cave-ins and risk to workers.
7. Where original surface is pavement or concrete, the surface shall be saw cut to provide clean edges and assist in the surface restoration.
8. Where satisfactory bearing soil for foundations is not found at the indicated levels, the Architect/Engineer or their representative shall be notified immediately, and no further work shall be done until further instructions are given by the Architect/Engineer or their representative.

C. Dewatering:

1. Contractor shall furnish, install, operate, and remove all dewatering pumps and pipes needed to keep trenches and pits free of water.

D. Underground Obstructions:

1. Known underground piping, foundations, and other obstructions in the vicinity of construction are shown on the drawings. Use great care in making installations near underground obstruction.
2. If objects not shown on the drawings are encountered, remove, relocate, or perform extra work as directed by the Architect/Engineer.

E. Fill and Backfilling:

1. Utilities Bedding: Lay underground utilities on minimum of 6"sand bedding or CA6 crushed stone. Compact bedding under utilities smooth, with no sharp edges protruding, to protect the utilities from puncture. Shape bedding to provide continuous support for bells, joints, and barrels of utilities and for joints and fittings.
2. Envelope around utilities to 6" above utilities: Place and compact sand or CA6 to a height of 6" over utilities in 6" layers. Each layer shall be placed, then carefully and uniformly tamped, to eliminate lateral or vertical displacement. After connection joints are made, any misalignment can be corrected by tamping backfill around the utilities.
3. Backfill from 6" above utilities to earthen grade: Place all backfill materials above the utilities in uniform layers not exceeding 6" deep. Each layer shall be placed, then carefully and uniformly tamped, to eliminate lateral or vertical displacement.
4. Backfill from 6" above utilities to below slabs or paved area: Where the fill and backfill will ultimately be under a building, floor or paving, each layer of backfill materials shall be compacted to 95% of the maximum density determined by AASHTO Designation T 99 or ASTM Designation D 698. Moisture content of soil at time of compaction shall not exceed plus or minus 2% of optimum moisture content determined by AASHTO T 99 or ASTM D 698 test.
5. Backfill Materials: Native soil materials may be used as backfill if approved by the Geotechnical Engineer. Backfill material shall be free of rock or gravel larger than 3" in any dimension and shall be free of debris, waste, frozen materials, vegetation, high void content, and other deleterious materials. Water shall not be permitted to rise in unbackfilled trenches.
6. Dispose of excess excavated earth as directed.
7. Backfill all trenches and excavations immediately after installing utilities or removal of forms, unless other protection is provided.
8. Around piers and isolated foundations and structures, backfill and fill shall be placed and consolidated simultaneously on all sides to prevent wedge action and displacement. Fill and backfill materials shall be spread in 6 inch uniform horizontal layers with each layer compacted separately to required density.

F. Surface Restoration:

1. Where trenches are cut through existing graded, planted, or landscaped areas, the areas shall be restored to the original condition. Replace all planting removed or damaged to its original condition. A minimum of 6 inches of topsoil shall be applied where disturbed areas are to be seeded or sodded.
2. Concrete or asphalt type pavement, seal coat, rock, gravel or earth surfaces removed or damaged shall be replaced with comparable materials and restored to original condition.

3.3 ARCHITECT/ENGINEER OBSERVATION OF WORK

A. The Contractor shall provide seven (7) calendar days' notice to the Architect/Engineer prior to:

1. Placing fill over underground and underslab utilities.
2. Covering exterior walls, interior partitions and chases.

3. Installing hard or suspended ceilings and soffits.

B. The Architect/Engineer will have the opportunity to review the installation and provide a written report noting deficiencies requiring correction. The Contractor's schedule shall account for these reviews and show them as line items in the approved schedule.

C. Above-Ceiling Final Observation

1. All work above the ceilings must be complete prior to the Architect/Engineer's review. This includes, but is not limited to:

   a. Pipe wall penetrations are sealed.
   b. Pipe identification is installed.
   c. Branch piping in the location of sprinklers shall be dropped to the ceiling.

2. In order to prevent the Above-Ceiling Final Observation from occurring too early, the Contractor shall review the status of the work and certify, in writing, that the work is ready for the Above-Ceiling Final Observation.
3. It is understood that if the Architect/Engineer finds the ceilings have been installed prior to this review and prior to 7 days elapsing, the Architect/Engineer may not recommend further payments to the contractor until such time as full access has been provided.

3.4 PROJECT CLOSEOUT

A. The following paragraphs supplement the requirements of Division 01.

B. Final Jobsite Observation:

1. In order to prevent the Final Jobsite Observation from occurring too early, the Contractor is required to review the completion status of the project and certify that the job is ready for the final jobsite observation.
2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review.
3. Upon Contractor certification that the project is complete and ready for a final observation, the Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.
4. It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineer's additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

C. Before final payment is authorized, this Contractor must submit the following:

1. Operation and maintenance manuals with copies of approved shop drawings.
2. Record documents including marked-up or reproducible drawings and specifications.

3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of This Contractor and shall be signed by the Owner's representatives.
4. Inspection report by the State Fire Marshal of the fire protection system.
5. Start-up reports on all equipment requiring a factory installation inspection or start-up.
6. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site and place in location as directed; receipt by Architect/Engineer required prior to final payment approval.

3.5 OPERATION AND MAINTENANCE MANUALS

A. General:

1. Provide an electronic copy of the O&M manuals as described below for Architect/Engineer's review and approval. The electronic copy shall be corrected as required to address the Architect/Engineer's comments. Once corrected, electronic copies and paper copies shall be distributed as directed by the Architect/Engineer.
2. Approved O&M manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.

B. Electronic Submittal Procedures:

1. Distribution: Email the O&M manual as attachments to all parties designated by the Architect/Engineer.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. O&M file name: O&M.div21.contractor.YYYYMMDD
    b. Transmittal file name: O&Mtransmittal.div21.contractor.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.
6. Provide the Owner with an approved copy of the O&M manual on compact discs (CD), digital video discs (DVD), or flash drives with a permanently affixed label, printed with the title "Operation and Maintenance Instructions", title of the project and subject matter of disc/flash drive when multiple disc/flash drives are required.
7. All text shall be searchable.

8. Bookmarks shall be used, dividing information first by specification section, then systems, major equipment and finally individual items. All bookmark titles shall include the nomenclature used in the construction documents and shall be an active link to the first page of the section being referenced.

C. Operation and Maintenance Instructions shall include:

1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all subcontractors, and major equipment suppliers, with addresses, telephone numbers, website addresses, email addresses and point of contacts. Website URLs and email addresses shall be active links in the electronic submittal.
2. Table of Contents: Include a table of contents describing specification section, systems, major equipment, and individual items.
3. Copies of all final approved shop drawings and submittals. Include Architect's/Engineer's shop drawing review comments. Insert the individual shop drawing directly after the Operation and Maintenance information for the item(s) in the review form.
4. Copy of final approved test and balance reports.
5. Copies of all factory inspections and/or equipment startup reports.
6. Copies of warranties.
7. Schematic electrical power/controls wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
8. Dimensional drawings of equipment.
9. Capacities and utility consumption of equipment.
10. Detailed parts lists with lists of suppliers.
11. Operating procedures for each system.
12. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
13. Repair procedures for major components.
14. List of lubricants in all equipment and recommended frequency of lubrication.
15. Instruction books, cards, and manuals furnished with the equipment.

3.6 INSTRUCTING THE OWNER'S REPRESENTATIVES

A. Adequately instruct the Owner's designated representatives in the maintenance, care, and operation of all systems installed under this contract.

B. Provide verbal and written instructions to the Owner's representatives by FACTORY PERSONNEL in the care, maintenance, and operation of the equipment and systems.

C. Contractor shall make a DVD video recording of instructions to the Owner while explaining the system so additional personnel may view the instructions at a later date. The video recording shall be the property of the Owner.

D. The Owner has the option to make a video recording of all instructions. Coordinate schedule of instructions to facilitate this recording.

E. The instructions shall include:

1. Explanation of all system flow diagrams.

2. Maintenance of equipment.
3. Start-up procedures for all major equipment.
4. Explanation of seasonal system changes.
5. Description of emergency system operation.

F. Notify the Architect/Engineer of the time and place for the verbal instructions to be given to the Owner's representative so a representative can attend if desired.

G. Minimum hours of instruction for each item shall be:

1. Sprinkler System(s) - 8 hours.

H. The Contractor shall prepare a detailed, written training agenda and submit it to the Architect/Engineer a minimum of two weeks prior to the formal training for approval. The written agenda shall include specific training points within the items described above. For example: how to adjust setpoints, troubleshooting, proper start-up, proper shut-down, seasonal changes, draining, venting, changing filters, changing belts, etc. Failure to provide and follow an approved training agenda may result in additional training required at the expense of the Contractor.

I. Operating Instructions:

1. Contractor is responsible for all instructions to the Owner's representatives for the fire protection and control systems.
2. If the Contractor does not have staff that can adequately provide the required instructions the Contractor shall include in the bid an adequate amount to reimburse the Owner for the Architect/Engineer to perform these services.

3.7 SYSTEM STARTING AND ADJUSTING

A. The fire protection systems shall be complete and operating. System startup, testing, adjusting, and balancing to obtain satisfactory system performance is the responsibility of the Contractor. This includes calibration and adjustments of all controls, noise level adjustments and final comfort adjustments as required.

B. Complete all manufacturer-recommended startup procedures and checklists to verify proper motor rotation, electrical power voltage is within equipment limitations, equipment controls maintain pressures and temperatures within acceptable ranges, all filters and protective guards are in-place, acceptable access is provided for maintenance and servicing, and equipment operation does not pose a danger to personnel or property.

C. All operating conditions and control sequences shall be tested during the start-up period. Test all interlocks, safety shutdowns, controls, and alarms.

D. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to ensure that all systems perform properly. If the Architect/Engineer is requested to visit the job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period, through no fault of the design; the Contractor shall reimburse the

Owner on a time and materials basis for services rendered at the Architect/Engineer's standard hourly rates in effect when the services are requested. The Contractor shall pay the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

3.8 RECORD DOCUMENTS

A. The following paragraphs supplement Division 01 requirements.

B. Maintain at the job site a separate and complete set of fire protection drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.

C. Mark drawings to indicate revisions to piping size and location, both exterior and interior; including locations of other control devices, and other units requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned from column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located; Change Orders; concealed control system devices.

D. Before completion of the project, a set of reproducible fire protection drawings will be given to the Contractor for transfer of all as-built conditions from the paper set maintained at the job site. All marks on reproducibles shall be clear and permanent.

E. Mark specifications to show approved substitutions; Change Orders, and actual equipment and materials used.

F. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.

G. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

3.9 PAINTING

A. This Contractor shall paint the following items:

1. All piping in mechanical room
2. Piping exposed in kitchen

B. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available.

C. Equipment in finished areas that will be painted to match the room decor will be painted by others. Should this Contractor install equipment in a finished area after the area has been painted, the Contractor shall have the equipment and all its supports, hangers, etc., painted to match the room decor.

D. Equipment cabinets, casings, covers, metal jackets, etc., in equipment rooms or concealed spaces, shall be furnished in standard or prime finish, free from scratches, abrasions, chips, etc.

E. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with baked enamel finish coat free from scratches, abrasions, chips, etc. If color option is specified or is standard to the unit, this Contractor shall, before ordering, verify with the Architect/Engineer the color preference and furnish this color.

F. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, storage room, etc., furnished by this Contractor. Equipment furnished with a factory coat of paint and enamel need not be painted, provided the factory applied finish is not marred or spattered. If so, equipment shall be refinished with the same paint as was factory applied.

G. Paint all outdoor uninsulated steel piping the color selected by Owner or Architect/Engineer.

H. After surfaces have been thoroughly cleaned and are free of oil, dirt, and other foreign matter, paint all pipes and equipment with the following:

1. Bare Metal Surfaces: Apply one coat of primer suitable for the metal being painted. Finish with two coats of Alkyd base enamel paint.
2. Color of paint shall be as follows:

a. All piping in mechanical room:

1) Fire Protection: Red pipe/white letters

b. Piping exposed in kitchen:

1) All Piping: White

3.10 ADJUST AND CLEAN

A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project. Clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material from all equipment.

B. Clean all areas where moisture is present. Immediately report any mold, biological growth, or water damage.

C. Remove all rust, scale, dirt, oils, stickers and thoroughly clean exterior of all exposed piping, hangers, and accessories.

D. Remove all rubbish, debris, etc., accumulated during construction from the premises.

3.11 SPECIAL REQUIREMENTS

A. Contractor shall coordinate the installation of all equipment, valves, etc., with other trades to maintain clear access area for servicing.

B. All equipment shall be installed in such a way to maximize access to parts needing service or maintenance. Review the final field location, placement, and orientation of equipment with the Owner's designated representative prior to setting equipment.

C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's designated representative will result in removal and reinstallation of the equipment at the Contractor's expense.

3.12 IAQ MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION

A. Contractors shall make all reasonable efforts to prevent construction activities from affecting the air quality of the occupied areas of the building or outdoor areas near the building. These measures shall include, but not be limited to:

1. All contractors shall endeavor to minimize the amount of contaminants generated during construction. Methods to be employed shall include, but not be limited to:

    a. Minimizing the amount of dust generated.
    b. Reducing solvent fumes and VOC emissions.
    c. Maintain good housekeeping practices, including sweeping and periodic dust and debris removal. There should be no visible haze in the air.

2. Request that the Owner designate an IAQ representative.
3. Review and receive approval from the Owner's IAQ representative for all IAQ-related construction activities and negative pressure containment plans.
4. Inform the IAQ representative of all conditions that could adversely impact IAQ, including operations that will produce higher than normal dust production or odors.
5. Schedule activities that may cause IAQ conditions that are not acceptable to the Owner's IAQ representative during unoccupied periods.
6. Request copies of and follow all of the Owner's IAQ and infection control policies.
7. Unless no other access is possible, the entrance to construction site shall not be through the existing facility.
8. To minimize growth of infectious organisms, do not permit damp areas in or near the construction area to remain for over 24 hours.
9. In addition to the criteria above, provide measures as recommended in the SMACNA "IAQ Guidelines for Occupied Buildings Under Construction".

READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

To prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to your requesting a final job observation.

1. Penetrations fire sealed and labeled in accordance with specifications.
2. All pumps operating and balanced.
3. Fire protection system operational.
4. Pipes labeled.

Accepted by:

Prime Contractor _____

By _____ Date _____

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Architect/Engineer so that the final observation can be scheduled.

It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

END OF SECTION 21 05 00

SECTION 21 05 05 - FIRE SUPPRESSION DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Mechanical Demolition.

B. Cutting and Patching.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment shall be as specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. THE DRAWINGS ARE INTENDED TO INDICATE THE GENERAL SCOPE OF WORK AND DO NOT SHOW EVERY PIPE, DUCT, OR PIECE OF EQUIPMENT THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE AND VERIFY CONDITIONS PRIOR TO SUBMITTING A BID.

B. Where walls, ceilings, etc., are shown as being removed on general drawings, the Contractor shall remove all mechanical equipment, devices, fixtures, piping, ducts, systems, etc., from the removed area.

C. Where ceilings, walls, partitions, etc., are temporarily removed and replaced by others, This Contractor shall remove, store, and replace equipment, devices, fixtures, pipes, ducts, systems, etc.

D. Verify that abandoned utilities serve only abandoned equipment or facilities. Extend services to facilities or equipment that shall remain in operation following demolition.

E. Coordinate work with all other Contractors and the Owner. Schedule removal of equipment to avoid conflicts.

F. This Contractor shall verify all existing equipment sizes and capacities where equipment is scheduled to be replaced or modified, prior to ordering new equipment.

G. Bid submittal shall mean the Contractor has visited the project site and verified existing conditions and scope of work.

3.2 PREPARATION

A. Disconnect fire protection systems in walls, floors, and ceilings scheduled for removal.

B. Provide temporary connections to maintain existing systems in service during construction. When work must be performed on operating equipment, use personnel experienced in such operations.

3.3 DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned piping to source of supply and/or main lines.

C. Remove exposed abandoned pipes, including abandoned pipes above accessible ceilings. Cut pipes above ceilings, below floors and behind walls. Cap remaining lines. Repair building construction to match original. Remove all clamps, hangers, supports, etc. associated with pipe and duct removal.

D. Disconnect and remove mechanical devices and equipment serving equipment that has been removed.

E. Repair adjacent construction and finishes damaged during demolition and extension work.

F. Maintain access to existing mechanical installations which remain. Modify installation or provide access panels as appropriate.

G. Extend existing installations using materials and methods compatible with existing installations, or as specified.

3.4 CUTTING AND PATCHING

A. This Contractor is responsible for all penetrations of existing construction required to complete the work of this project. Refer to Section 21 05 29 for additional requirements.

B. Penetrations in existing construction should be reviewed carefully prior to proceeding with any work.

C. Penetrations shall be neat and clean with smooth and/or finished edges. Core drill where possible for clean opening.

D. Repair existing construction as required after penetration is complete to restore to original condition. Use similar materials and match adjacent construction unless otherwise noted or agreed to by the Architect/Engineer prior to start of work.

E. Floor slab on grade is a structural slab. All penetrations shall be X-rayed prior to cutting and/or drilling to avoid rebar or utilities encased in floor construction. Provide rebar dowels to replace damaged rebar and pin existing slab with patched slab. Refer to discipline plans for additional information.

F. This Contractor is responsible for <u>all</u> costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.

3.5 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Clean all systems adjacent to project which are affected by the dust and debris caused by this construction.

C. FIRE PROTECTION ITEMS REMOVED AND NOT RELOCATED REMAIN THE PROPERTY OF THE OWNER. CONTRACTOR SHALL PLACE ITEMS RETAINED BY THE OWNER IN A LOCATION COORDINATED WITH THE OWNER. THE CONTRACTOR SHALL DISPOSE OF MATERIAL THE OWNER DOES NOT WANT TO REUSE OR RETAIN FOR MAINTENANCE PURPOSES.

3.6 SPECIAL REQUIREMENTS

A. Install temporary filter media over outside air intakes which are within 100 feet of the limits of construction or as noted on the drawings. This Contractor shall complete any cleaning required for existing systems which are affected by construction dust and debris.

B. Review locations of all new penetrations in existing floor slabs or walls. Determine construction type and review for possible interferences. Bring all concerns to the attention of the Architect/Engineer before proceeding.

END OF SECTION 21 05 05

SECTION 21 05 29 - FIRE SUPPRESSION SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Hangers, Supports, and Associated Anchors.

B. Equipment Bases and Supports.

C. Sleeves and Seals.

D. Flashing and Sealing of Equipment and Pipe Stacks.

E. Cutting of Openings.

F. Escutcheon Plates and Trim.

1.2 QUALITY ASSURANCE

A. Support Sprinkler Piping in conformance with NFPA 13.

B. Support Standpipes in conformance with NFPA 14.

1.3 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Furnish sleeves and hanger inserts to General Contractor for placement into formwork.

PART 2 - PRODUCTS

2.1 SEISMIC RESTRAINTS

A. Refer to Section 21 05 50 for additional requirements for seismic restraints.

2.2 HANGER RODS

A. Hanger rods for single rod hangers supporting steel, copper, and CPVC piping shall conform to the following:

Pipe Size	Rod Size
4" and smaller	3/8"
5" 6", and 8"	1/2"
10"	5/8"

B. Hanger rods and accessories used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.

C. All hanger rods, nuts, washers, clevises, etc., in damp areas shall have ASTM A123 hot-dip galvanized finish applied after fabrication. This applies to the following areas:

2.3 PIPE HANGERS AND SUPPORTS

A. General:

1. All pipe hangers, clamps, and supports shall conform to Manufacturers Standardization Society MSS-SP-58, 69, 89, and 127 (where applicable).

B. Vertical Supports:

1. Support and laterally brace vertical pipes at every floor level in multi-story structures, and more frequently when required by applicable codes, but never at intervals over 15 feet. Support vertical pipes with riser clamps installed below hubs, couplings or lugs. Provide sufficient flexibility to accommodate expansion and contraction without compromising fire barrier penetrations and other fixed takeoff locations.

    a. Products:

        1) Anvil Fig.
        2) CT121
        3) Cooper/B-Line Fig.
        4) B3373CT
        5) Erico Model 510
        6) Nibco/Tolco Fib. 82

2. Wall supports shall be used where vertical height of structure exceeds minimum spacing requirements. Install wall supports at same spacing as hangers or strut supports along vertical length of pipe runs.
3. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or self-tapping masonry screws. For expansion anchors into hollow concrete block, use sleeve-type anchors designed for the specific application. Do not fasten in masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic inserts.

C. Hangers and Clamps:

1. Hangers in direct contact with bare copper pipe shall include plastic pipe insert similar to Unistrut Cush-A-Clamp, Hydra-Zorb, Erico Cushion Clamp or Cooper Vibra-Clamp.
2. Unless otherwise indicated, hangers shall be as follows:

    a. Clevis Type: Service: Bare Metal Pipe, Rigid Plastic Pipe

        1) Products: Bare Steel, Plastic or Insulated Pipe

            a) Anvil Fig. 260
            b) Cooper/B-Line Fig. 3100
            c) Erico Model 400
            d) Nibco/Tolco Fig. 1.

2) Products: Bare Copper Pipe

a) Anvil Fig. CT65
b) Cooper/B-Line Fig. B3104CT
c) Erico Model 402
d) Nibco/Tolco Fig. 81.

b. Adjustable Swivel Ring Type: Service: Bare Metal Pipe - 4 inches and Smaller

1) Products: Bare Steel Pipe

a) Anvil Fig. 69
b) Cooper/B-Line Fig. B3170NF
c) Erico Model FCN
d) Nibco/Tolco Fig. 200.

2) Products: Bare Copper Pipe

a) Anvil Fig. CT69
b) Cooper/B-Line Fig. B170CT
c) Nibco/Tolco Fig. 202.

3. Support may be fabricated from U-channel strut or similar shapes. Piping less than 4" in diameter shall be secured to strut with clamps of proper design and capacity as required to maintain spacing and alignment. Strut shall be independently supported from hanger drops or building structure. Size and support shall be per manufacturer's installation requirements for structural support of piping. Clamps shall not interrupt piping insulation.
4. Strut used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.
5. Strut used in damp areas listed in hanger rods shall have ASTM A123 hot-dip galvanized finish applied after fabrication.
6. Unless otherwise indicated, pipe supports for use with struts shall be as follows:

a. Clamp Type: Service: Bare Metal Pipe, Rigid Plastic Pipe

1) Clamps in direct contact with copper pipe shall include plastic pipe insert similar to Unistrut Cush-A-Clamp, Hydra-Zorb, Erico Cushion Clamp or Cooper Vibra-Clamp.
2) Pipes subject to expansion and contraction shall have clamps slightly oversized to allow limited pipe movement.
3) Products: Bare Steel, Plastic or Insulated Pipe

a) Unistrut Fig. P1100 or P2500
b) Cooper/B-Line Fig. B2000 or B2400
c) Nibco/Tolco Fig. A-14 or 2STR.

4) Products: Bare Copper Pipe

a) Cooper/B-Line; Fig. BVT

D. Upper (Structural) Attachments:

1. Unless otherwise shown, upper attachments for hanger rods or support struts shall be as follows:

a. Steel Structure Clamps: C-Type Wide Flange Beam Clamps (for use on top and/or bottom of wide flanges. Not permitted for use with bar-joists.)

1) Products:

a) Anvil Fig. 92
b) Cooper/B-Line Fig. B3033/B3034
c) Erico Model 300
d) Nibco/Tolco 68.

b. Scissor Type Beam Clamps (for use with bar-joists and wide flange):

1) Products:

a) Anvil Fig. 228, 292
b) Cooper/B-Line Fig. B3054
c) Erico Model 360
d) Nibco/Tolco Fig. 329.

c. Concentrically Loaded Open Web Joist Hangers (for use with bar joists):

1) Products:

a) MCL. M1, M2 or M3

d. Concrete Anchors: Fasten to concrete using cast-in or post-installed anchors designed per the requirements of Appendix D of ACI 318-14. Post-installed anchors shall be qualified for use in cracked concrete by ACI-355.2.

e. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or self-tapping masonry screws. For expansion anchors into hollow concrete block, use sleeve-type anchors designed for the specific application. Do not fasten in masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic inserts.

f. Steel Structure Welding:

1) Unless otherwise noted, hangers, clips, and auxiliary support steel may be welded in lieu of bolting, clamping, or riveting to the building structural frame. Take adequate precautions during all welding operations for fire prevention and for protecting walls and ceilings from being damaged by smoke.

2.4 OPENINGS IN FLOORS, WALLS AND CEILINGS

A. Exact locations of all openings for the installation of materials shall be determined by the Contractor and given to the General Contractor for installation or construction as the structure is built.

B. Coordinate all openings with other Contractors.

C. Hire the proper tradesman and furnish all labor, material and equipment to cut openings in or through existing structures, or openings in new structures that were not installed, or additional openings. Repair all spalling and damage to the satisfaction of the Architect/Engineer. Make saw cuts before breaking out concrete to ensure even and uniform opening edges.

D. Said cutting shall be at the complete expense of each Contractor. Failure to coordinate openings with other Contractors shall not exempt the Contractor from providing openings at Contractor's expense.

E. Do not cut structural members without written approval of the Architect or Structural Engineer.

Model	Service	Element Material	Temperature Range
S	Standard (Stainless)	EPDM	-40°F to 250°F
T	Fire Seals (1 hour)	Silicone	-67°F to 400°F
FS	Fire Seals (3 hours)	Silicone	-67°F to 400°F
OS	Oil Resistant/Stainless	Nitrile	-40ºF to 210ºF

2.5 ESCUTCHEON PLATES AND TRIM

A. Fit escutcheons to all insulated or uninsulated exposed pipes passing through walls, floors, or ceilings of finished rooms.

B. Escutcheons shall be heavy gauge, cold rolled steel, copper coated under a chromium plated finish, heavy spring clip, rigid hinge and latch.

C. Install galvanized steel (unless otherwise indicated) trim strip to cover vacant space and raw construction edges of all rectangular openings in finished rooms. This includes duct and pipe openings.

2.6 PIPE PENETRATIONS

A. Seal all pipe penetrations. Seal non-rated walls and floor penetrations with grout or caulk. Backing material may be used.

B. Seal fire rated wall and floor penetrations with fire seal system as specified.

2.7 PIPE ANCHORS

A. Provide all items needed to allow adequate expansion and contraction of all piping. All piping shall be supported, guided, aligned, and anchored as required.

B. Repair all piping leaks and associated damage. Pipes shall not rub on any part of the building.

2.8 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

PART 3 - EXECUTION

3.1 FIRE SUPPRESSION SUPPORTS AND ANCHORS

A. General Installation Requirements:

1. Install all items per manufacturer's instructions.
2. Coordinate the location and method of support of piping systems with all installations under other Divisions and Sections of the Specifications.
3. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
4. Supports shall extend directly to building structure. Do not support piping from duct hangers. Do not allow lighting or ceiling supports to be hung from piping supports.

B. Supports Requirements:

1. Where building structural steel is fireproofed, all hangers, clamps, auxiliary steel, etc., which attach to it shall be installed prior to application of fireproofing. Repair all fireproofing damaged during pipe installation.
2. Set all concrete inserts in place before pouring concrete.
3. Furnish, install and prime all auxiliary structural steel for support of piping systems that are not shown on the Drawings as being by others.
4. Install hangers and supports complete with lock nuts, clamps, rods, bolts, couplings, swivels, inserts and required accessories.
5. Hangers for horizontal piping shall have adequate means of vertical adjustment for alignment.

C. Pipe Requirements:

1. Support all piping and equipment, including valves, strainers, and other specialties and accessories to avoid objectionable or excessive stress, deflection, swaying, sagging or vibration in the piping or building structure during erection, cleaning, testing and normal operation of the systems.
2. Do not, however, restrain piping to cause it to snake or buckle between supports or to prevent proper movement due to expansion and contraction.
3. Support piping at equipment and valves so they can be disconnected and removed without further supporting the piping.
4. Piping shall not introduce strains or distortion to connected equipment.
5. Parallel horizontal pipes may be supported on trapeze hangers made of structural shapes and hanger rods; otherwise, pipes shall be supported with individual hangers.

6. Trapeze hangers may be used where ducts interfere with normal pipe hanging.
7. Provide additional supports where pipe changes direction, adjacent to flanged valves and strainers, at equipment connections and heavy fittings.
8. Provide at least one hanger adjacent to each joint in grooved end steel pipe with mechanical couplings.

D. Provided the installation complies with all loading requirements of truss and joist manufacturers, the following practices are acceptable:

1. Loads of 100 lbs or less may be attached anywhere along the top or bottom chords of trusses or joists with a minimum 3' spacing between loads.
2. Loads greater than 100 lbs. must be hung concentrically and may be hung from top or bottom chord, provided one of the following conditions is met:

    a. The hanger is attached within 6" from a web/chord joint.
    b. Additional L2x2x1/4 web reinforcement is installed per manufacturer's requirements.

3. It is prohibited to cantilever a load using an angle or other structural component that is attached to a truss or joist in such a fashion that a torsional force is applied to that structural member.
4. If conditions cannot be met, coordinate installation with truss or joist manufacturer and contact Architect/Engineer.

E. After piping and insulation installation are complete, cut hanger rods back at trapeze supports so they do not extend more than 3/4" below bottom face of lowest fastener and blunt any sharp edges.

F. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (limitation not required with concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and architectural items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.

G. Do not exceed the manufacturer's recommended maximum load for any hanger or support.

H. Steel/Concrete Structure: Spacing of hangers shall in no case exceed the following:

1. Steel (All steel pipe unless otherwise noted):

    a. Maximum Spacing:

        1) 1-1/4" & under: 12'-0"
        2) 1-1/2" & larger: 15'-0"

2. Steel (Schedule 40 lightweight alternative):

    a. Maximum Spacing:

        1) 3" & under: 12'-0"

3. Hard Drawn Copper:

    a. Maximum Spacing:

        1) 1" & under: 8'-0"
        2) 1-1/4" to 1-1/2": 10'-0"
        3) 2" to 3": 12'-0"
        4) 3-1/2" & larger: 15'-0"

I. Installation of hangers shall conform to MSS SP-58, 69, 89, and applicable NFPA standards.

END OF SECTION 21 05 29

SECTION 21 05 48 - FIRE PROTECTION VIBRATION ISOLATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Vibration Isolation.

B. Flexible Connectors.

1.2 SUBMITTALS

A. Submit shop drawings per Section 21 05 00 and the Vibration Isolation Submittal Form at the end of this section.

B. Vibration isolation submittals may be included with equipment being isolated, but must comply with this section.

C. Base submittals shall include equipment served, construction, coatings, weights, and dimensions.

D. Isolator submittals shall include:

1. Equipment served
2. Type of Isolator
3. Load in Pounds per Isolator
4. Recommended Maximum Load for Isolator
5. Spring Constants of Isolators (for Spring Isolators)
6. Load vs. Deflection Curves (for Neoprene Isolators)
7. Specified Deflection
8. Deflection to Solid (at least 150% of calculated deflection)
9. Loaded (Operating) Deflection
10. Free Height
11. Loaded Height
12. Kx/Ky (horizontal to vertical stiffness ratio - for spring isolators)
13. Materials and Coatings
14. Spring Diameters

E. Make separate calculations for each isolator on equipment where the load is not equally distributed.

F. Flexible connector shop drawings shall include overall face-to-face length and all specified properties.

G. Submit certification that equipment, accessories, and components will withstand seismic forces defined in Section 21 05 50. Include the following:

1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

PART 2 - PRODUCTS

2.1 BASIC CONSTRUCTION AND REQUIREMENTS

A. Vibration isolation for this project is subject to seismic restraint requirements of Section 21 05 50.

B. Vibration isolators shall have either known undeflected heights or other markings so deflection under load can be verified.

C. All isolators shall operate in the linear portion of their load versus deflection curve. The linear portion of the deflection curve of all spring isolators shall extend 50% beyond the calculated operating deflection (e.g., 3" for 2" calculated deflection). The point of 50% additional deflection shall not exceed the recommended load rating of the isolator.

D. The lateral to vertical stiffness ratio (Kx/Ky) of spring isolators shall be between 0.8 and 2.0.

E. All isolators shall be designed or treated for corrosion resistance. Steel bases shall be cleaned of welding slag and primed for interior use. Bolts, nuts and washers shall be zinc electroplated. All damage to coatings shall be field repaired with two coats of zinc rich coating.

F. Equip all mountings used with structural steel bases with height-saving brackets. Bottoms of the brackets shall be 1-1/2" to 2-1/2" above the floor or housekeeping pad, unless shown otherwise on the drawings. Steel bases shall have at least four points of support.

G. All isolators, except M1, shall have provision for leveling.

2.2 MOUNTINGS

A. Type M1:

1. 0.75" thick waffled neoprene pad with minimum static deflection of 0.07" at calculated load and 0.11" at maximum load. For loads less than 15 pounds, the deflection at calculated load requirement is waived, but the isolator must have a maximum stiffness of the ratio of 45#/0.35".

2. Units need not be bolted down unless called for or needed to prevent movement. If bolted down, prevent short circuiting with neoprene bushings and washers between bolts and isolators.
3. Manufacturers:

    a. Mason "Super W"
    b. Kinetics "NGS"
    c. Amber/Booth "SPNR"
    d. Vibration Eliminator Co "400N"

2.3 HANGERS

A. Type H1:

1. Vibration hangers shall consist of a double-deflection neoprene element with a projecting bushing or oversized opening to prevent steel-to-steel contact.
2. Static deflection shall be at least 0.15" at calculated load and 0.35" at maximum rated load.
3. Provide hangers with end connections as required for hanging ductwork or piping.
4. Manufacturers:

    a. Mason "HD"
    b. Kinetics "RH"
    c. Aeroflex "RHD"
    d. Vibration Eliminator Co. "IC/3C/3CTD"
    e. Vibro Acoustics "RH"

2.4 FLEXIBLE CONNECTORS (NOISE AND VIBRATION ELIMINATORS)

A. Type FC1:

1. Spherical flexible connectors with multiple plies of nylon tire cord fabric and either EPDM or molded and cured neoprene. Outdoor units shall be EPDM.
2. Steel aircraft cables or threaded steel rods shall be used to prevent excess elongation.
3. All straight through connections shall be made with twin-spheres properly pre-extended as recommended by the manufacturer.
4. Connectors up to 2" size may have threaded ends.
5. Connectors 2-1/2" and over shall have floating steel flanges recessed to lock raised face neoprene flanges.
6. All connectors shall be rated for a minimum working pressure of 150 psi at 200°F.
7. Manufacturer:

    a. Metraflex "Double Cable-Sphere"
    b. Minnesota Flex Corp.
    c. Mercer "200 Series"
    d. Twin City Hose "MS2".

B. Type FC2:

1. Stainless steel flexible connectors with corrugated stainless steel hose body and stainless steel braided casing.
2. Rated for minimum working pressures of 150 psi at 70°F and 100 psi at 800°F.
3. Sizes 2" and under shall have steel threaded connections.
4. Sizes 2-1/2" and over shall have 150 lb. steel flanges.
5. Suitable for 1/2" permanent misalignment.
6. Manufacturers:

    a. Mason or Mercer "BSS-GU"
    b. Metraflex "ML"
    c. Twin City Hose "TCHS"
    d. American "BOA B4-1"
    e. Flexible Metal Hose Company "FM-21"
    f. Wheatley

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Install all products per manufacturer's recommendations.

B. Provide vibration isolation as indicated on the drawings and as described herein.

C. Clean the surface below all mountings that are not bolted down and apply adhesive cement equal to Mason Type WG between mounting and floor. If movement occurs, bolt mountings down. Isolate bolts from baseplates with neoprene washers and bushings.

D. All static deflections listed in the drawings and specifications are the minimum acceptable actual deflection of the isolator under the weight of the installed equipment - not the maximum rated deflection of the isolator.

E. Support equipment to be mounted on structural steel frames with isolators under the frames or under brackets welded to the frames. Where frames are not needed, fasten isolators directly to the equipment.

F. Where a specific quantity of hangers is noted in these specifications, it shall mean hanger pairs for support points that require multiple hangers, such as pipes supported on a strut rack.

3.2 PIPE ISOLATION

A. The first three hangers from vibration-isolated equipment shall be type H1.

B. The first five hangers from vibration-isolated equipment shall have spring isolators with the same static deflection as the equipment. Use type H1 or H2 as required for the specified deflection. The next five hangers shall be type H1.

C. For base mounted pumps without resilient mountings, the first five hangers shall be Type H1.

D. Install flexible connectors in all piping connected to vibration producing equipment. This includes all fans, base-mounted pumps, compressors, etc. Absence of flexible connectors on piping diagrams does not imply that they are not required.

E. Use Type FC1 where pressures are lower than 150 psi, temperatures are below 220°F, and the fluid handled is compatible with neoprene and EPDM.

F. Use Type FC2 for all other services. FC2 shall be installed parallel with equipment shafts.

G. Provide sufficient piping flexibility for vibrating equipment or furnish flexible connectors with appropriate temperature and pressure ratings.

H. Vibration isolators shall not cause any change in position of piping that will result in stresses in connections or misalignment of shafts or bearings. Equipment and piping shall be maintained in a rigid position during installation. Do not transfer load to the isolators until the installation is complete and under full operational load. Hanger H3 and Mounting M4 may be used instead of other products for this purpose.

I. Support piping to prevent extension of flexible connectors.

3.3 VIBRATION ISOLATION SCHEDULE

A. Inline Pumps:

1. Base Type: NA
2. Static Deflection: 0.75"
3. Flexible Connections: NA

B. Base-Mounted Pumps:

1. Base Type: NA
2. Isolator Type: NA
3. Static Deflection: NA
4. Flexible Connections: FC-1

C. Base-Mounted Pumps:

1. Static Deflection: 0.75"1.5"
2. Flexible Connections: FC-1

D. Air Compressor:

1. Base Type: NA
2. Isolator Type: M1
3. Static Deflection: NA
4. Flexible Connections: NA

E. Air Compressor:

1. Static Deflection: 1.5"
2. Flexible Connections: NA

END OF SECTION 21 05 48

SECTION 21 05 50 - SEISMIC REQUIREMENTS FOR EQUIPMENT AND SUPPORTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Seismic Requirements.

1.2 QUALITY ASSURANCE

A. General:

1. The contractor shall retain a specialty consultant or equipment manufacturer to develop a seismic restraint and support system and perform seismic calculations in accordance with these specifications, state, and local codes.
2. Items used for seismic restraint of equipment and systems shall be specifically manufactured for seismic restraint.
3. These requirements are beyond those listed in Section 21 05 29 of these specifications. Where a conflict arises between the seismic requirements of this section and any other section, the Architect/Engineer shall be immediately notified for direction to proceed.

B. Manufacturer:

1. System Supports/Restraints: Company specializing in the manufacture of products specified in this Section.
2. Equipment: Each company providing equipment that must meet seismic requirements shall provide certification included in project submittals the equipment supplied for the project meets or exceeds the seismic requirements of the project.

C. Testing Agency: An independent testing agency, acceptable to Authorities Having Jurisdiction, with experience and capability to conduct the testing indicated.

D. Installer: Company specializing in performing the work of this Section.

1.3 SUBMITTALS

A. Submit under provisions of Section 21 05 00.

B. Shop Drawings:

1. Calculations, restraint selections, and installation details shall be designed and sealed by a Professional Engineer licensed in the state where the project is located experienced in seismic restraint design and installation.
2. Coordination Drawings: Plans and sections drawn to scale, coordinating seismic bracing of mechanical components with other systems and equipment in the vicinity, including other seismic restraints.

3. Manufacturer's Certifications: Professional Engineer licensed in the state where the project is located shall review and approve manufacturer's certifications of compliance.
4. System Supports/Restraints - Submit for each condition requiring seismic bracing:

    a. Calculations for each seismic brace and detail utilized on the project.
    b. Plan drawings showing locations and types of seismic braces on contractor fabrication/installation drawings.
    c. Cross-reference between details and plan drawings to indicate exactly which brace is being installed at each location. Details provided are to clearly indicate attachments to structure, correctly representing the fastening requirements of bracing.
    d. Clear indication of brace design forces and maximum potential component forces at attachment points to building structure for confirmation of acceptability by the Structural Engineer of Record.

5. Equipment - Submit for each piece of equipment supplied:

    a. Certification that the equipment supplied for the project meets or exceeds the seismic requirements specified.
    b. Specific details of seismic design features of equipment and maximum seismic loads imparted to the structural support.
    c. Engineering calculations and details for equipment anchorage and support structure.

C. A seismic restraint designer shall be provided whether or not exceptions listed in the applicable building code are met. If seismic restraints are not provided for a system that requires seismic bracing, the seismic designer shall submit a signed and sealed letter to the Architect/Engineer and Authorities Having Jurisdiction stating the exceptions, along with code reference, utilized for each item. Seismic designer shall review system installation for general conformance to the exception requirements stated in the code and document, in writing, the system has been installed in accordance to the exception.

1.4 TESTING AND INSPECTION

A. Special Inspection and Testing shall be done in accordance with Chapter 17 of the International Building Code.

B. The Owner shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704 and 1705.

C. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected. The fabricator shall submit a certificate of compliance that the work has been performed in accordance with the approved plans and specifications to the building official and the Architect and Engineer of Record.

D. The Special Inspection Agency shall furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The reports shall be completed and furnished within 48 hours of inspected work. A final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency's knowledge, in conformance with the approved plans and specifications shall be submitted.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site. Accept material on site in factory containers and packing. Inspect for damage. Protect from damage and contamination by maintaining factory packaging until installation. Follow manufacturer's instructions for storage.

1.6 DESIGN REQUIREMENTS

A. This project is subject to the seismic bracing requirements of the International Building Code, 2012 edition.

B. The following criteria are applicable to this project:

1. Risk Category: IV
2. Seismic Importance Factor: IE = 1.5Seismic Design Category:D
3. Component Amplification Factors (ap) and Component Response Modification Factors (Rp) shall be taken from Table 13.5-1 in ASCE 7-16 for the individual equipment or system being restrained.
4. Component Importance Factors (Ip) shall be taken from Section 13.1.3 in ASCE 7-16 for the individual equipment or system being restrained.
5. The total height of the structure and the height of the system to be restrained within the structure shall be determined in coordination with architectural plans and the General Contractor.

C. Forces shall be calculated with the above requirements and Equation 13.3-1, -2, and -3 of ASCE 7-16, unless exempted by 13.1.4.

D. Equipment shall meet International Building Code and ASCE 7 seismic qualification requirements in concurrence with ICC ES AC156 Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems.

E. All seismic anchorage and bracing shall comply with the St. Louis County Rules & Regulations on Anchorage & Sway Bracing - Mechanical, Electrical & Plumbing (MEP) System Components.

F. All seismic anchorage and bracing shall comply with FM Global Property Loss Prevention Data Sheet 1-11, Fire Following Earthquakes.

1.7 COORDINATION

A. Coordinate layout and installation of seismic bracing with building structural systems and architectural features, and with mechanical, fire-protection, electrical and other building features in the vicinity.

B. Coordinate concrete bases with building structural system.

1.8 WARRANTY

A. Provide one-year warranty on parts and labor for manufacturer defects and installation workmanship.

PART 2 - PRODUCTS

2.1 SUPPLIERS

A. Following is a partial list of manufacturer/supplier contact information for seismic restraints:

1. B-Line Systems, Inc. (800) 851-7415, www.b-line.com.
2. Unistrut Corporation http://www.unistrut.us/
3. Kinetics Noise Control (877) 457-2695, www.kineticsnoise.com.
4. Mason Industries, Inc. www.mason-ind.com.
5. Loos & Co., Inc. (800) 321-5667, www.loosnaples.com.
6. Tolco (909) 737-5599, www.tolco.com
7. ISAT 877.523.6060, www.isatsb.com
8. Vibro-Acoustics (416) 291-7371, https://virs.vibro-acoustics.com/

2.2 SEISMIC DESIGN CRITERIA

A. This section describes the requirements for seismic restraint of systems and equipment related to continued operation of the facility after a design seismic event.

B. Definitions

1. Stay in Place:

a. All systems and equipment shall be anchored and restrained such that the anchoring system is intended not to fail and equipment and/or system components will not fall.

2.3 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

A. General:

1. Seismic restraint designer shall coordinate all attachments with the Structural Engineer of Record; refer to submittal requirements.
2. The seismic restraint design shall be based on actual equipment data obtained from manufacturer's submittals or the manufacturer. The equipment manufacturer shall verify and provide written certification the attachment points on the equipment can accept the combination of seismic, weight, and other imposed loads.
3. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.

4. Analysis shall detail anchoring methods, bolt diameter, embedment, and weld length.
5. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code.
6. All seismic restraints and combination isolator/restraints shall have verification of their seismic capabilities witnessed by an independent testing agency.

B. Friction from gravity loads shall not be considered resistance to seismic forces.

C. Fire protection systems shall meet the requirements of NFPA-13 and NFPA-14 for the building seismic requirements.

D. Housekeeping Pads:

1. Reinforced housekeeping pads shall be provided to handle shear, tension, and compression forces with proper reinforcement, doweling, and attachments connecting the pad to the structural slab.

2.4 SEISMIC RESTRAINT AND CONSTRUCTION OF EQUIPMENT

A. Equipment supplied for the project shall be designed to meet the requirements of lateral forces calculated using the applicable code and method described above.

B. The following is a partial list of equipment that shall be restrained and that shall be constructed to meet seismic forces described in this section:

1. Fire Protection Equipment
2. Fire Pumps

2.5 MATERIALS

A. Use the following materials for restraints:

1. Indoor Dry Locations: Steel, zinc plated.
2. Outdoors and Damp Locations: Galvanized steel.
3. Corrosive Locations: Stainless steel.

2.6 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

A. Strength: Defined in reports by ICC Evaluation Service or another agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.

B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type. Comply with IBC, ACI and ICC ES requirements for cracked concrete anchors.

C. Concrete Inserts: Steel-channel type.

D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM F3125, Grade A 325.

E. Welding Lugs: Comply with MSS SP-69, Type 57.

F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.

G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings and matched to the type and size of anchor bolts and studs used.

H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings and matched to the type and size of attachment devices used.

2.7 SEISMIC BRACING COMPONENTS

A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch-thick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.

1. Materials for Channel: ASTM A 1011, GR 33.
2. Materials for Fittings and Accessories: ASTM A 635, ASTM A 576, or ASTM A 36.
3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.
4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.

B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.

C. Cable-Type Bracing Assemblies: Zinc-coated, high-strength steel wire rope cable attached to steel thimbles, brackets, and bolts designed for cable service.

1. Arrange units for attachment to the braced component at one end and to the structure at the other end.
2. Wire Rope Cable: Comply with ASTM A 603. Use 49- or 133-strand cable with a minimum strength of 2 times the calculated maximum seismic force to be resisted.

D. Hanger Rod Stiffeners: Slotted steel channels with internally bolted connections to hanger rod.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to the applicable code sections and Authority Having Jurisdiction for the exact seismic restraint requirements of piping, ductwork, conduit, equipment, etc.

B. Layout of transverse and longitudinal bracing shall follow recommendations of approved design standards listed in Part 1 of this specification section.

C. All rigid floor mounted equipment shall have a resilient media between the equipment mounting hole and the anchor bolt in concrete.

D. All seismic restraint systems shall be installed in strict accordance with the manufacturer's written instructions and all certified submittal data.

E. Installation of seismic restraints shall not cause any change in position of equipment, piping, or ductwork, resulting in stresses or misalignment.

F. No rigid connections between equipment and the building structure shall be made that degrade the noise and vibration-isolation system specified.

G. Do not install any equipment, piping, duct, or conduit that makes rigid connections with the building unless isolation is not specified.

H. Coordinate work with all other trades to avoid rigid contact with the building. Any conflicts with other trades that will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions shall be brought to the Architect/Engineer's attention prior to specific equipment selection.

I. Prior to installation, bring to the Architect/Engineer's attention any discrepancies between the specifications and the field conditions, or changes required due to specific equipment selection.

J. Bracing may occur from flanges of structural beams, upper truss cords of bar joists, cast in place inserts, or International Code Council approved seismic anchors for installation in concrete.

K. Cable restraints shall be installed slightly slack to avoid short-circuiting the isolated suspended equipment, ductwork, piping, or conduit.

L. Cable assemblies shall be installed taut on non-isolated systems. Solid braces may be used in place of cables on rigidly attached systems only.

M. Do not install cables over sharp corners.

N. Brace support rods when necessary to accept compressive loads. Welding of compression braces to the vertical support rods is not acceptable.

O. Provide reinforced clevis bolts when required.

P. The vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not acceptable.

Q. Post-Installed anchors shall be provided to meet seismic requirements.

R. Vertical pipe risers flexibly supported to accommodate thermal motion and/or pipe vibration shall be guided to maintain pipe stability and provide horizontal seismic restraint.

S. Seismic restraints shall be mechanically attached to the system. Looping restraints around the system is not acceptable.

T. Piping crossing building seismic or expansion joints, passing from building to building, or supported from different portions of the building shall be installed to allow differential support displacements without damaging the pipe, equipment connections, or support connections. Pipe offsets, loops, anchors, and guides shall be installed as required to provide required motion capability and limit motion of adjacent piping.

U. Water tanks shall be secured to their saddles by welding or proper concrete attachment, and those saddles shall be properly attached to the structure.

V. Brace all terminal units with water coils as required by the building code and provide flexible connection to the coil if bracing is required.

W. Independently brace duct mounted equipment (terminal units, in-line fans, etc.) and the associated suspended ductwork.

X. Do not brace a system to two different structures such as a wall and a ceiling.

Y. Provide appropriately sized openings in walls, floors, and ceilings for anticipated seismic movement. Provide fire seal systems in fire-rated walls.

Z. Positively attach all roof mounted equipment to roof curbs. Positively attach all roof curbs to building structure.

AA. Exposed seismic supports in occupied areas shall be guarded or covered to protect occupants.

BB. Coordinate seismic bracing of architecturally exposed ductwork with the Architect/Engineer.

3.2 SEISMIC RESTRAINT EXCLUSIONS

A. Refer to the applicable code sections and Authority Having Jurisdiction for allowable exclusions.

END OF SECTION 21 05 50

SECTION 21 05 53 - FIRE SUPPRESSION IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Identification of products installed under Division 21.

1.2 REFERENCES

A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

B. ASTM B-1, B-3, and B-8 for copper conductors.

C. ASTM D-1248 for Polyethylene Extrusion Materials, ICEA S-70-547 Weatherproof Resistant Polyethylene Conductors, ICEA S-61-402/NEMA WC5 Thermoplastic Insulated Wire & Cable, ICEA S-95-658/NEMA WC70 Non-Shielded 0 - 2kv Cables.

D. UL 1581 Standard for Electrical Wires, Cables, and Flexible Cords.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. 3M

B. Bunting

C. Calpico

D. Craftmark

E. Emedco

F. Kolbi Industries

G. Seton

H. W.H. Brady

I. Marking Services.

2.2 MATERIALS

A. All pipe markers (purchased or stenciled) shall conform to ANSI A13.1. Marker lengths and letter sizes shall be at least the following:

OD of Pipe or Insulation	Marker Length	Size of Letters
Up to and including 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"
8" to 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

Plastic tags may be used for outside diameters under 3/4"

B. Aluminum Nameplates: Black enamel background with natural aluminum border and engraved letters furnished with two mounting holes and screws.

C. Brass Tags: Brass background with engraved black letters. Tag size minimum 1-1/2" square or 1-1/2" round.

D. Vinyl Pipe Markers: Colored vinyl with permanent pressure sensitive adhesive backing.

E. Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape 6" wide by 3.5 mils thick, manufactured for direct burial, with aluminum foil core for location by non-ferric metal detectors and bold lettering identifying buried item.

F. Tracer Wire:

1. Single copper conductors shall be solid or stranded annealed or hard uncoated copper per UL83 and ASTM requirements. Tracer tape or copper-coated steel wire is not acceptable.
2. Conductor shall be insulated with HMWPE as specified and applied in a concentric manner. The minimum at any point shall not be less than 90% of the specified average thickness in compliance with UL 83.
3. Tracer wire shall be continuously spark tested at 7500 Volts DC. Other electrical and mechanical tests shall be in accordance with UL 1581.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all products per manufacturer's recommendations.

B. Degrease and clean surfaces to receive adhesive for identification materials.

C. Valves:

1. All valves (except shutoff valves at equipment) shall have numbered tags.
2. Provide or replace numbered tags on all existing valves that are connected to new systems or that have been revised.
3. Provide all existing valves used to extend utilities to this project with numbered tags. Review tag numbering sequence with the Owner prior to ordering tags.
4. Secure tags with heavy duty key chain and brass "S" link or with mechanically fastened plastic straps.

5. Attach to handwheel or around valve stem. On lever operated valves, drill the lever to attach tags.
6. Number all tags and show the service of the pipe.
7. Provide two sets of laminated 8-1/2" x 11" (letter size) copies of a valve directory listing all valves, with respective tag numbers, uses, and locations. The directory shall be reviewed by the Owner and Architect/Engineer prior to laminating final copies. Laminated copies shall have brass eyelet in at least one corner for easy hanging.

D. Pipe Markers:

1. Adhesive Backed Markers: Use Brady Style 1, 2, or 3 on pipes 3" diameter and larger. Use Brady Style 4, 6, or 8 on pipes under 3" diameter. Similar styles by other listed manufacturers are acceptable. Secure all markers at both ends with a wrap of pressure sensitive tape completely around the pipe.
2. Snap-on Markers: Use Seton "Setmark" on pipes up to 5-7/8" OD. Use Seton "Setmark" with nylon or Velcro ties for pipes 6" OD and over. Similar styles by other listed manufacturers are acceptable.

3. Apply markers and arrows in the following locations where clearly visible:

    a. At each valve.
    b. On both sides of walls that pipes penetrate.
    c. At least every 20 feet along all pipes.
    d. On each riser and each leg of each "T" joint.
    e. At least once in every room and each story traversed.

4. Underground Pipe Markers: Install 8" to 10" below grade, directly above buried pipes.

E. Equipment:

1. All equipment not easily identifiable such as controls, relays, gauges, etc.; and all equipment in an area remote from its function shall have nameplates or plastic tags listing name, function, and drawing symbol. Do not label exposed equipment in public areas.
2. Mechanical equipment that is not covered by the U.S. National Appliance Energy Conservation Act (NAECA) of 1987 shall carry a permanent label installed by the manufacturer stating that the equipment complies with the requirements of ASHRAE 90.1.

F. Tracer Wire:

1. Tracer wire shall be installed on top of all non-metallic buried utilities.
2. Tracer wire shall be taped directly to plastic water or drainpipe.
3. Tracer wire shall not be fastened directly or indirectly to gas piping.
4. Tracer wire when attached shall be secured to the pipe a minimum of every 10 feet and at all changes of direction.
5. Tape shall be Polyken "930-35", Protecto-Wrap "310", or approved equal.
6. Tracer wire shall be continuous between boxes and shall be tested for continuity.

7. Splices in tracer wire shall be made with a waterproof splice kit to prevent corrosion. Wire nuts shall not be used.
8. The tracer wire shall daylight to grade through a 2" PVC conduit, at the point of the utility entrance to building. PVC conduit shall be capped and labeled as future contact point to locate the utility.

3.2 SCHEDULE

A. Pipes to be marked shall be labeled with text shown as follows, regardless of which method or material is used:

1. FIRE PROTECTION WATER: White lettering; red background
2. SPRINKLER WATER: White lettering; red background
3. Tracer Wire - Water Pipe Lines: White lettering; green background
4. Tracer Wire - All other buried types: White lettering; green background

B. All piping downstream of the fire protection backflow preventer, upstream of sprinkler zone valves, standpipe piping, and combination sprinkler standpipe piping shall be labeled Fire Protection Water. All piping downstream of sprinkler zone valves shall be labeled Sprinkler Water.

END OF SECTION 21 05 53

SECTION 21 13 00 - FIRE PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe, Fittings, Valves, and Connections for Fire Protection System.

B. Wet-Pipe Sprinkler System.

C. Dry-Pipe Sprinkler System.

1.2 QUALITY ASSURANCE

A. Welding Materials and Procedures: Conform to ASME Code.

B. Equipment and Components: Bear UL label or marking.

C. Valves: Bear UL label or marking. Provide manufacturer's name and pressure rating marked on valve body. Pressure rating shall match specified pipe system pressure rating. Remanufactured valves are not acceptable.

D. Specialist Firm: Company specializing in sprinkler systems with minimum three years' experience.

E. Sprinkler design drawings submitted by the Contractor shall be prepared by a NICET Water-Based Fire Protection Systems Layout Level III or Level IV designer or PE.

1.3 SUBMITTALS

A. Submit shop drawings per Section 21 05 00. Indicate pipe materials, joining methods, supports, floor and wall penetration seals, sprinklers, equipment data and ratings, and hydraulic calculations.

B. Submit detailed pipe and sprinkler layout and other calculations and forms as described in NFPA 13.

C. Submit detailed working drawings and obtain review of them in the following order:

1. Engineer/Architect Owner's Insurance Company Local Fire Department
2. Architect/Engineer

D. Working drawings shall include piping and sprinkler layout, sprinkler types and ratings, sections and elevations at critical points. Show coordination with lighting, ductwork, and diffusers, and indicate basic flow and hydraulic design information, including main location and date that the test was taken.

E. Submit dry-pipe calculations including water delivery time and air supply refill defined in NFPA 13. Water delivery time and air supply shall meet the requirements set forth in NFPA 13.

F. Submit electrical power/controls wiring diagrams and product data indicating general assembly, components, safety controls, and service connections.

G. Provide the Owner with one copy of NFPA 25. Standard for the Inspection Testing and Maintenance of Water-based Fire Protection Systems.

1.4 EXTRA STOCK

A. Provide metal storage cabinet, wrenches for each sprinkler type, and extra sprinklers per NFPA 13 and applicable building code.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store valves and sprinklers in shipping containers, with labels in place.

B. Provide temporary protective coating on iron and steel valves.

C. Maintain temporary end caps and closures in place until installation.

1.6 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Furnish sleeves to General Contractor for placement in walls and floors. Sleeve location to be determined by the Fire Protection Contractor prior to construction. If additional sleeves are required, they shall be core drilled by the Fire Protection Contractor.

1.7 SYSTEM DESCRIPTION

A. Contractor shall design and install the following water-based fire protection systems for the areas noted on the contract documents:

1. Wet pipe sprinkler system(s)
2. Dry pipe sprinkler system(s)

B. Sprinkler systems shall be designed and installed according to the following standard(s):

1. NFPA 13 - Standard for the Installation of Sprinkler Systems

C. System design and installation shall include all requirements by the Authority Having Jurisdiction, local and state building codes, and Owner's insurance company in addition to the previously listed design standard(s). Those requirements shall take precedence over the contract documents in the case of discrepancies.

D. Systems shall be hydraulically calculated in accordance with the applicable design standard(s). Contractor is responsible for final pipe sizing based on results from hydraulic calculations. Pipe sizing shown on drawings for service entrance and main risers is preliminary and for coordination purposes only.

E. Coordinate with Plumbing Contractor for installation of a floor drain with collection funnel below the backflow preventer.

1.8 COORDINATION DRAWINGS

A. Reference Coordination Drawings article in Section 21 05 00 for required fire protection systems electronic CAD drawings to be provided to Coordinating Contractor for inclusion into composite coordination drawings.

1.9 OPERATION AND MAINTENANCE DATA

A. Submit manufacturers' operation and maintenance data. Include written maintenance data on components of system, servicing requirements, and record drawings.

1.10 JOB CONDITIONS

A. Fire Protection Contractor shall determine the flow and pressure available at the service connection. The Fire Protection Contractor is responsible to verify this information and make all tests required. Base all pipe sizing and hydraulic calculations on flow test data no older than 18 months.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS - WET PIPE SPRINKLER SYSTEMS

A. Piping - 2" and Under (Steel Pipe):

1. Design Pressure: 175 psig
2. Pipe: Schedule 40, black steel, ASTM A53, ASTM A795, UL. Inner wall shall be coated with an anti-MIC (microbiologically influenced corrosion) coating.
3. Schedule 40/Lightweight Schedule 40 Joints: Threaded or grooved.
4. Fittings:

    a. Threaded:

        1) Cast iron, Class 125, black, UL, ANSI/ASME B16.4.
        2) Malleable iron, Class 150, black, UL, ANSI/ASME B16.3.
        3) Ductile iron, Class 150, black, UL, ANSI/ASME B16.3.

    b. Grooved:

        1) Ductile iron housing ASTM A-536, Grade 65-45-12, UL, enamel coating, Grade E (Type A) EPDM molded pressure-responsive gaskets suited for 40°F to 150°F. Carbon steel bolts and nuts.

5. Unions: Class 150 malleable iron, ANSI B16.39, ground joint with copper or copper alloy-to-iron seat.

B. Piping - 2-1/2" and Above (Steel Pipe):

1. Design Pressure: 175 psig
2. Pipe: Schedule 10, black steel, ASTM A135, ASTM A795, UL. Inner wall shall be coated with an anti-MIC (microbiologically influenced corrosion) coating.
3. Joints: Grooved.

4. Fittings:

    a. Grooved:

        1) Ductile iron housing ASTM A-536, Grade 65-45-12, UL, enamel coating, Grade E (Type A) EPDM molded pressure-responsive gaskets suited for 40°F to 150°F. Carbon steel bolts and nuts.

C. Piping - 3" and Under (Seamless Copper Tube):

1. Design Pressure: 125 psig.
2. Piping - 3" and Under:

    a. Tubing: Type L drawn temper seamless copper tube, ASTM B88.
    b. Joints: Solder with Type 95-5 solder. 50-50 solder is not acceptable.
    c. Fittings: Wrought copper solder joint, ASME B16.22.
3. Usage: Inside MRI spaces.

2.2 FLEXIBLE FIRE SPRINKLER CONNECTIONS

A. Flexible Connection: Stainless steel hose, 175 psig max working pressure, fully welded non-mechanical fittings, stainless steel braid, maximum of 6' hose length, leak-tested with a minimum 7/8" internal corrugated hose diameter made of 304 stainless steel, end fittings made of carbon or stainless steel. Outlet of end fittings shall be 1/2" or 3/4" to match sprinkler connection. UL/FM.

B. Ceiling Bracket: G90 galvanized steel, direct attachment type, integrated snap-on clip ends, tamper resistance screws, removable attachment hub with set screw for attachment and adjustment of stainless-steel hose.

1. Manufacturers:

    a. Flexhead Industries
    b. Victaulic VicFlex,
    c. Sprinkflex
    d. or approved equal.

2.3 PIPE AND FITTINGS - DRY PIPE SPRINKLER SYSTEMS

A. Piping - 2" and Under (Steel):

1. Design Pressure: 175 psig. Pipe: Schedule 40, galvanized, ANSI/ASTM A153, ASTM A795, UL/FM. Inner wall shall be coated with an anti-MIC (microbiologically influenced corrosion) coating.
2. Joints: Threaded or roll grooved.
3. Fittings:

    a. Threaded:

        1) Cast iron, Class 125, galvanized, UL/FM, ANSI/ASME B16.4ASTM A153.

2) Malleable iron, Class 150 galvanized, UL/FM, ANSI/ASME B16.3ASTM A153.
3) Ductile iron, Class 150, galvanized, UL/FM, ANSI/ASME B16.3ASTM A153.

b. Grooved:

1) Ductile iron housing ASTM A-536, Grade 65-45-12, UL, galvanized coating, Grade E (Type A) EPDM molded pressure-responsive gaskets suited for 40°F to 150°F. Carbon steel bolts and nuts. Provide flush gap style gasket. Lubricate gasket according to manufacturer recommendations.

4. Unions: Class 150 malleable iron, ANSI B16.39, ground joint with copper or copper alloy-to-iron seat.

B. Piping - 2-1/2" and Above:

1. Design Pressure: 175 psig.
2. Pipe: Schedule 10, galvanized ASTM A135, ASTM A795, UL.
3. Joints: Roll grooved or cut grooved.
4. Fittings:

a. Grooved:

1) Ductile iron housing ASTM A-536 Grade 65-45-12, UL, galvanized coating, Grade E (Type A) EPDM molded pressure-responsive gaskets suited for 40°F to 150°F. Carbon steel bolts and nuts.

2.4 PIPE AND FITTINGS - WET STANDPIPE SYSTEM

A. Refer to Article 2.1 PIPE AND FITTINGS - WET PIPE SYSTEMS.

2.5 PIPE AND FITTINGS - DRY STANDPIPE SYSTEM

A. Refer to Article 2.2 PIPE AND FITTINGS - DRY PIPE SYSTEMS.

2.6 VALVES

A. Provide handwheels for gate valves. Provide gear operators for butterfly valves.

B. Provide all connections to match pipe joints. Valves shall be same size as pipe.

2.7 BACKFLOW PREVENTERS

A. Provide backflow preventers as required by code and as specified on the drawings.

2.8 EQUIPMENT

A. Equipment shall be as scheduled on the drawings.

2.9 RISER LABELING AND IDENTIFICATION

A. Hydraulic nameplates shall be affixed to each riser and shall include the following minimum information:

1. Installation contractor
2. Date installed
3. Riser location
4. Number of sprinklers
5. Basis of design (density GPM/ft2 and area of coverage ft2
6. Water flow rate (GPM) and residual pressure (psi) at the base of riser
7. Hose stream allowance (GPM).
8. Occupancy classification
9. Commodity classification (If applicable)
10. Maximum storage height (if applicable)

B. A dedicated antifreeze placard is required where a remote antifreeze system is provided. The placard is to be placed on the main valve serving the antifreeze system to document the manufacturer type and brand of the solution and the system volume.

2.10 PIPE LABELING AND IDENTIFICATION

A. All pipe shall be marked along its length by the manufacturer in such a way as to properly identify the type of pipe. The manufacturer pipe marking shall be visible on every piece of pipe over 2 ft (600 mm) long. Manufacturer pipe identification shall include the manufacturer's name, model designation, and/or schedule.

PART 3 - EXECUTION

3.1 INSTALLATION - PIPING

A. General Installation Requirements:

1. Coordinate piping and sprinkler locations with all other trades. Ductwork, diffusers and light fixture locations shall have priority over sprinkler piping and sprinklers.
2. Ream pipe and tube ends to full inside diameter. Remove burrs. Remove scale and foreign material, inside and outside, before assembly.
3. Die cut screw joints with full cut standard taper pipe threads.
4. Coat threads with pipe joint compound or wrap with Teflon tape.
5. Locate piping to minimize obstruction of other work.
6. Route piping in concealed spaces above finished ceiling.
7. Use full and double lengths of pipe wherever possible.
8. Slope all piping for complete drainage. Install auxiliary drains for all trapped piping per NFPA 13.
9. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be the size of the largest pipe shown connecting to it.
10. Comply with manufacturer's installation instructions.

B. Steel Piping:

1. In steel piping, main sized saddle branch connections or direct connections of branches to main is permitted if main is one pipe size larger than the branch for up to 6" mains and if main is two pipe sizes larger than branch for 8" and larger mains. Do not project branch pipes into main pipes.

C. Wall/Floor Penetration:

1. Provide sleeves when penetrating floors and walls.
2. Seal pipes passing through exterior walls with a wall seal per Section 21 05 29. Provide Schedule 40 galvanized sleeve at least 2 pipe sizes larger than the pipe. Sleeves through floors shall extend minimum 1.5" above finished floor.
3. Fire seal all pipe and sleeve penetrations (both wall and floor) to maintain fire separation required without restraining pipe.

D. Installation Requirements in Electrical Rooms:

1. Do not install piping or other equipment above electrical switchboards or panelboards. This includes a dedicated space extending 25 feet from the floor to the structural ceiling with width and depth equal to the equipment. Fire protection equipment dedicated to the electrical equipment room or space may be installed above equipment if other alternatives are not available.

E. Hangers and Supports:

1. Provide hangers and supports as required by NFPA 13 and UL/FM, with the following exceptions:

    a. Do not use powder driven devices, explosive devices, wooden plugs, or plastic inserts.
    b. Do not install fasteners to carry the load in tension, unless absolutely necessary.

F. Exposed Piping:

1. Install chrome plated steel escutcheons where exposed pipes penetrate walls or floors.
2. Remove all scale, rust, dirt, oils, stickers and thoroughly clean exterior of all bare metal exposed piping, hangers, and accessories in preparation to be painted.

G. Dry Pipe System:

1. All fire protection piping within rooms served by dry pipe valves or preaction systems shall be downstream of dry pipe valve. Wet piping upstream of these devices shall not be installed above these rooms.
2. Refrigerated spaces served by dry pipe valves shall have a 30" easily removable section of pipe located immediately upstream and downstream of pipe entrance to a refrigerated space per NFPA 13. Piping shall be pitched back toward the dry pipe assembly. Air intake for compression devices serving preaction or dry pipe systems shall be from the refrigerated area.

3.2 INSTALLATION - VALVES

A. Install gate valves with stems upright or horizontal, not inverted.

B. Backflow Preventer:

1. Provide an air gap fitting and piping to drain. On 2-1/2" and larger units, install a tail piece from air gap fitting to drain to prevent water from spraying out of drain air gap receptor. Maintain air gap distance required by Code.
2. Units shall be field tested and tagged in accordance with manufacturer's instructions by a certified tester before initial operation.
3. Install unit between 12" and 60" above finish floor.
4. Provide monitor switches on all shutoff valves.

C. Dry Pipe Valve:

1. Install dry pipe valve in heated area to prevent mechanical damage.
2. Provide all required trim and accessories for a fully functioning dry pipe valve system.

D. Shutoff Valve:

1. Install buried shutoff valves in valve boxes. Provide post indicators.
2. Provide drain valves at main shutoff valves, low points of piping and apparatus.
3. Provide monitor switches on all shutoff valves.

3.3 INSTALLATION - EQUIPMENT

A. Coordinate piping and sprinkler locations with all other trades. Ductwork, diffusers and light fixture locations shall have priority over system equipment and sprinklers.

B. Fire Department Connection:

1. Locate fire department connection in an accessible location as approved by the local fire department with sufficient clearance from walls, obstructions, and adjacent Siamese connectors to allow full swing of fire department wrench handle.

C. Alarm Bell:

1. Locate outside horn and strobe on building wall as shown on drawings.
2. Wire all horn and strobes, flow switches and supervisory switches to fire alarm system. All wiring shall be in conduit and meet the requirements of the electrical specifications.

D. Test Valves:

1. Install test valves where required. Pipe to outdoors or drain. Test connection shall have flow equivalent to the smallest K-factor sprinkler.

E. Sprinklers:

1. Locate sprinklers to clear lights, ducts and diffusers. Do not run sprinkler pipes through ducts. Ductwork has priority over sprinkler pipes. Offset pipes as needed.
2. Center sprinklers in two directions in ceiling tiles and provide offsets as required.
3. Do not allow concealed sprinkler cover plates to be painted. Sprinkler cover plates are to be factory painted only. Do not field paint.
4. Apply strippable or paper covers so concealed sprinkler cover plates do not receive field paint finish.

3.4 INSTALLATION - STANDPIPE AND HOSE SYSTEM

A. Locate and secure hose cabinet plumb.

B. Locate angle valve in cabinet at 60" above floor. Locate fire department connection below angle valve and not closer than 4" from side or bottom of cabinet.

C. Connect wet standpipe system to water source ahead of domestic water connection.

D. Where static pressure exceeds 175 psig at any hose station, provide pressure regulating valves to limit the pressure on hose to 100.

E. Where residual pressure at Class III hose station1-1/2" exceeds 100 psig, provide a pressure regulating valve to limit the residual pressure on the hose to 100 psig.

F. Provide connection for alarm and supervisory control to building alarm system.

G. Provide two-way fire department outlet on roof.

H. Install backflow preventer as required by local Authorities Having Jurisdiction and as indicated on Fire Protection Material List.

3.5 SYSTEMS CLEANING AND TESTING

A. General Requirement:

1. All water used for testing and remaining in the piping system shall be obtained from a potable water source.

B. Underground Piping:

1. Flush all underground piping with minimum flow equal to the system design flow but not less than the following:

a. 390 gpm for 4" pipes.
b. 880 gpm for 6" pipes.
c. 1560 gpm for 8" pipes.
d. 2440 gpm for 10" pipes.
e. 3500 gpm for 12" pipes.

2. Branches from existing or new underground mains to sprinkler risers shall be flushed out through two 2-1/2" hoses (with flow through open hose butts) attached to the riser with 4" temporary piping. Flushing through the drain of an alarm check or dry pipe valve is not acceptable.

C. Interior Piping:

1. Verify adequate water flow at the inspector's test connection.
2. Flush all interior piping to remove scale and other foreign material before placing system into service.
3. Hydrostatically test the entire interior piping system at a minimum of 200 psig or 50 psig more than the normal system working pressure for systems subjected to pressures more than 150 psig. Maintain test pressure for 2 hours without loss of pressure. Test shall be performed with dry pipe valves in open position to prevent valve damage.

D. Standpipe and Hose Systems:

1. Hydrostatically test standpipe and hose systems in accordance with NFPA 14 and applicable building code requirements.

E. Dry Piping:

1. On dry-pipe systems, also test the interior piping with an air pressure of 40 psi for 24 hours. Pressure loss shall not exceed 1-1/2 psi in 24 hours with allowance made for temperature change. An odorant, such as oil of wintergreen, may be added to help locate leaks.

F. Fire Alarm System:

1. Test the alarm system by operating the inspector's test connection or the alarm test valves. Verify that the building fire alarm system activates.
2. Adjust all monitor switches for proper operation.

END OF SECTION 21 13 00

SECTION 22 05 00 - BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements applicable to all Division 22 Sections. Also refer to Division 1 - General Requirements.

B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

1.2 SCOPE OF WORK

A. This Specification and the associated drawings govern the furnishing, installing, testing and placing into satisfactory operation the Mechanical Systems.

B. Each Contractor shall provide all new materials indicated on the drawings and/or in these specifications, and all items required to make the portion of the Mechanical Work a finished and working system.

C. All work will be awarded under a single General Contract. The division of work listed below is for the Contractor's convenience and lists normal breakdown of the work.

D. Scope of Work:

1. Plumbing Work shall include, but is not necessarily limited to:

    a. Furnish and install all items listed in the Plumbing Material List.
    b. Furnish and install a new domestic water service to the building.
    c. Furnish and install water meter and domestic water backflow preventer as required by Code.
    d. Furnish and install a complete domestic water piping system including cold, hot, and hot water circulating piping within the building. Insulate all piping as specified.
    e. Furnish and install complete gas piping system including all meter requirements.
    f. Furnish and install water softener.
    g. Furnish and install water heaters.
    h. Furnish and install a new fire protection service to the building including backflow preventer as required by Code.
    i. Furnish and install all fire hydrants and associated piping, valves, and supports including connection to the water main.
    j. Furnish and install condensate drain piping from plumbing related equipment such as ice machines.
    k. Furnish and install site storm water piping, cleanouts, and manholes.
    l. Furnish and install complete sanitary sewer and vent system.
    m. Furnish and install site sanitary sewer piping, cleanouts, and manholes.

n. Furnish and install seismic restraint and equipment designed for use in seismic conditions described in Section 22 05 50.
o. Furnish and install firestopping systems for penetrations of fire-rated construction associated with this Contractor's work.

2. Heating Work: Refer to Section 23 05 00 "Basic HVAC Requirements".
3. Air Conditioning and Ventilating Work: Refer to Section 23 05 00 "Basic HVAC Requirements".
4. Temperature Control Work: Refer to Section 23 05 00 "Basic HVAC Requirements".
5. Fire Protection Work: Refer to Section 21 05 00 "Basic Fire Suppression Requirements".
6. Testing, Adjusting, and Balancing Work: Refer to Section 23 05 00 "Basic HVAC Requirements".

1.3 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL & CONTROL CONTRACTORS

A. Definitions:

1. "Mechanical Contractors" refers to the following:

a. Plumbing Contractor.
b. Heating Contractor.
c. Air Conditioning and Ventilating Contractor.
d. Temperature Control Contractor.
e. Fire Protection Contractor.
f. Testing, Adjusting, and Balancing Contractor.

2. Motor Control Wiring: The wiring associated with the remote operation of the magnetic coils of magnetic motor starters or relays, or the wiring that permits direct cycling of motors by means of devices in series with the motor power wiring. In the latter case the devices are usually single phase and are usually connected to the motor power wiring through a manual motor starter having "Manual-Off-Auto" provisions.
3. Control devices such as start-stop push buttons, thermostats, pressure switches, flow switches, relays, etc., generally represent the types of equipment associated with motor control wiring.
4. Motor control wiring is single phase and usually 120 volts. In some instances, the voltage will be the same as the motor power wiring. Generally, where the motor power wiring exceeds 120 volts, a control transformer is used to give a control voltage of 120 volts.
5. Temperature Control Wiring: The wiring associated with the operation of a motorized damper, solenoid valve or motorized valve, etc., either modulating or two-position, as opposed to wiring which directly powers or controls a motor used to drive equipment such as fans, pumps, etc.

a. This wiring will be from a 120 volt source and may continue as 120 volt, or be reduced in voltage (24 volt) in which case a control transformer shall be furnished as part of the temperature control wiring.

6. Control Motor: An electric device used to operate dampers, valves, etc. It may be two-position or modulating. Conventional characteristics of such a motor are 24 volts, 60 cycles, 1 phase, although other voltages may be encountered.
7. Voltage is generally specified and scheduled as distribution voltage. Motor submittals may be based on utilization voltage if it corresponds to the correct distribution voltage.

Distribution/Nominal Voltage	Utilization Voltage
120	115
208	200
240	230
277	265
480	460

B. General:

1. The purpose of these Specifications is to outline the Electrical and Mechanical Contractor's responsibilities related to electrical work required for items such as temperature controls, mechanical equipment, fans, chillers, compressors and the like. The exact wiring requirements for much of the equipment cannot be determined until the systems have been selected and submittals reviewed. Therefore, the electrical drawings show only known wiring related to such items. All wiring not shown on the electrical drawings, but required for mechanical systems, is the responsibility of the Mechanical Contractor.
2. Where the drawings require the Electrical Contractor to wire between equipment furnished by the Mechanical Contractor, such wiring shall terminate at terminals provided in the equipment. The Mechanical Contractor shall provide complete electrical power/controls wiring diagrams and supervision to the Electrical Contractor and designate the terminal numbers for correct wiring.
3. All electrical work shall conform to the National Electrical Code. All provisions of the Electrical Specifications concerning wiring, protection, etc., apply to wiring provided by the Mechanical Contractor unless noted otherwise.
4. Control low (24V) and control line (120V) voltage wiring, conduit, and related switches and relays required for the automatic control and/or interlock of motors and equipment, including final connection, are to be furnished and installed under Divisions 21, 22 and 23. Materials and installation to conform to Class 1 or 2 requirements.
5. All Contractors shall establish utility elevations prior to fabrication and shall coordinate their material and equipment with other trades. When a conflict arises, priority is as follows:

    a. Light fixtures.
    b. Gravity flow piping, including steam and condensate.
    c. Electrical busduct.
    d. Sheet metal.
    e. Electrical cable trays, including access space.
    f. Sprinkler piping and other piping.
    g. Electrical conduits and wireway.

C. Mechanical Contractor's Responsibility:

1. Assumes responsibility for internal wiring of all equipment provided by the Mechanical Contractor, for example:

    a. Boiler Feed Pumps.
    b. Burners.
    c. Chillers.
    d. Computer Room Air Conditioning Units.
    e. Condensate Return Stations.
    f. Condensing Units.
    g. Makeup Air Units.
    h. Electric Humidifiers.
    i. Gas Trains.
    j. Package Air Handling Units.
    k. Packaged Rooftop Units.

2. Assumes all responsibility for the Temperature Control wiring, when the Temperature Control Contractor is a Subcontractor to the Mechanical Contractor.
3. Shall verify all existing equipment sizes and capacities where units are to be modified, moved or replaced. Contractor shall notify Architect/Engineer of any discrepancies prior to ordering new units or replacement parts, including replacements of equipment motors.
4. Temperature Control Subcontractor's Responsibility:

    a. Wiring of all devices needed to make the Temperature Control System functional.
    b. Verifying any control wiring on the electrical drawings as being by the Electrical Contractor. All wiring required for the Control System, but not shown on the electrical drawings, is the responsibility of the Temperature Control Subcontractor.
    c. Coordinating equipment locations (such as relays, transformers, etc.) with the Electrical Contractor, where wiring of the equipment is by the Electrical Contractor.

5. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

D. Electrical Contractor's Responsibility:

1. Provides all combination starters, manual starters and disconnect devices shown on the Electrical Drawings or indicated to be by the Electrical Contractor on the Mechanical Drawings or Specifications.
2. Installs and wires all remote control devices furnished by the Mechanical Contractor or Temperature Control Subcontractor when so noted on the Electrical Drawings.
3. Provides motor control and temperature control wiring, where so noted on the drawings.
4. Coordinate with the Mechanical Contractor for size of motors and/or other electrical devices involved with repair or replacement of existing equipment.

5. Furnishes, installs and connects all relays, etc., for automatic shutdown of certain fans upon actuation of the Fire Alarm System as indicated and specified in Division 28.
6. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

1.4 COORDINATION DRAWINGS

A. Definitions:

1. Coordination Drawings: A compilation of the pertinent layout and system drawings that show the sizes and locations, including elevations, of system components and required access areas to ensure that no two objects will occupy the same space.

    a. Mechanical trades shall include, but are not limited to, mechanical equipment, ductwork, fire protection systems, plumbing piping, medical gas systems, hydronic piping, steam and steam condensate piping, and any item that may impact coordination with other disciplines.
    b. Electrical trades shall include, but are not limited to, electrical equipment, conduit 1.5" and larger, conduit racks, cable trays, pull boxes, transformers, raceway, busway, lighting, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
    c. Technology trades shall include, but are not limited to, technology equipment, racks, conduit 1.5" and larger, conduit racks, cable trays, ladder rack, pull boxes, raceway, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
    d. Maintenance clearances and code-required dedicated space shall be included.
    e. The coordination drawings shall include all underground, underfloor, in-floor, in chase, and vertical trade items.

2. Spaces with open/cloud ceiling architecture shall indicate the overhead utilities and locate equipment as required to maintain clearance above lights. The intent for the installation is to maintain a maximum allowable vertical clearance and an organized/clean manner in the horizontal. Notify Architect/Engineer of the maximum clearance which can be maintained. Failure to comply will result in modifications with no cost to Owner.

    a. In cloud ceiling architecture, when open cabling/wire and/or cable tray crosses gaps between ceiling clouds and/or walls, cabling is to transition to conduits to span the gaps in order to conceal cabling from below.

3. The contractors shall use the coordination process to identify the proper sequence of installation of all utilities above ceilings and in other congested areas, to ensure an orderly and coordinated end result, and to provide adequate access for service and maintenance.

B. Participation:

1. The contractors and subcontractors responsible for work defined above shall participate in the coordination drawing process.
2. One contractor shall be designated as the Coordinating Contractor for purposes of preparing a complete set of composite electronic CAD coordination drawings that include all applicable trades, and for coordinating the activities related to this process. The Coordinating Contractor for this project shall be the Mechanical Contractor.

    a. The Coordinating Contractor shall utilize personnel familiar with requirements of this project and skilled as draftspersons/CAD operators, competent to prepare the required coordination drawings.

3. Electronic CAD drawings shall be submitted to the Coordinating Contractor for addition of work by other trades. IMEG will provide electronic file copies of applicable drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by IMEG. IMEG will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings.

C. Drawing Requirements:

1. The file format and file naming convention shall be coordinated with and agreed to by all contractors participating in the coordination process and the Owner.

    a. Scale of drawings:

        1) General plans: 1/4 Inch = 1 '-0" (minimum).
        2) Mechanical, electrical, communication rooms, and including the surrounding areas within 10 feet: 1/2 Inch = 1'-0" (minimum).
        3) Shafts and risers: 1/2 Inch = 1'-0" (minimum).
        4) Sections of shafts and mechanical and electrical equipment rooms: 1/4 Inch = 1 '-0" (minimum).
        5) Sections of congested areas: 1/2 Inch = 1'-0" (minimum).

2. Ductwork layout drawings shall be the baseline system for other components. Ductwork layout drawings shall be modified to accommodate other components as the coordination process progresses.
3. There may be more drawings required for risers, top and bottom levels of mechanical rooms, and shafts.
4. The minimum quantity of drawings will be established at the first coordination meeting and sent to the A/E for review. Additional drawings may be required if other areas of congestion are discovered during the coordination process.

D. General:

1. Coordination drawing files shall be made available to the A/E and Owner's Representative. The A/E will only review identified conflicts and give an opinion, but will not perform as a coordinator.
2. A plotted set of coordination drawings shall be available at the project site.

3. Coordination drawings are not shop drawings and shall not be submitted as such.
4. The contract drawings are schematic in nature and do not show every fitting and appurtenance for each utility. Each contractor is expected to have included in the bid sufficient fittings, material, and labor to allow for adjustments in routing of utilities made necessary by the coordination process and to provide a complete and functional system.
5. The contractors will not be allowed additional costs or time extensions due to participation in the coordination process.
6. The contractors will not be allowed additional costs or time extensions for additional fittings, reroutings or changes of duct size, that are essentially equivalent sizes to those shown on the drawings and determined necessary through the coordination process.
7. The A/E reserves the right to determine space priority of equipment in the event of spatial conflicts or interference between equipment, piping, conduit, ducts, and equipment provided by the trades.
8. Changes to the contract documents that are necessary for systems installation and coordination shall be brought to the attention of the A/E.
9. Access panels shall preferably occur only in gypsum board walls or plaster ceilings where indicated on the drawings.

    a. Access to mechanical, electrical, technology, and other items located above the ceiling shall be through accessible lay-in ceiling tile areas.
    b. Potential layout changes shall be made to avoid additional access panels.
    c. Additional access panels shall not be allowed without written approval from the A/E at the coordination drawing stage.
    d. Providing additional access panels shall be considered after other alternatives are reviewed and discarded by the A/E and the Owner's Representative.
    e. When additional access panels are required, they shall be provided without additional cost to the Owner.

10. Complete the coordination drawing process and obtain sign off of the drawings by all contractors prior to installing any of the components.
11. Conflicts that result after the coordination drawings are signed off shall be the responsibility of the contractor or subcontractor who did not properly identify their work requirements, or installed their work without proper coordination.
12. Updated coordination drawings that reflect as-built conditions may be used as record documents.

1.5 QUALITY ASSURANCE

A. Contractor's Responsibility Prior to Submitting Pricing Data:

1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guidelines, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Design Team any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Design Team will be done at the Contractor's risk.

B. Qualifications:

1. Only products of reputable manufacturers are acceptable.
2. All Contractors and subcontractors shall employ only workers skilled in their trades.

C. Compliance with Codes, Laws, Ordinances:

1. Conform to all requirements of the of Caseyville, Illinois Codes, Laws, Ordinances and other regulations having jurisdiction.
2. Conform to all State Codes.
3. Conform to Federal Act S.3874 requiring the reduction of lead in drinking water.
4. If there is a discrepancy between the codes and regulations and these specifications, the Architect/Engineer shall determine the method or equipment used.
5. If the Contractor notes, at the time of bidding, that any parts of the drawings or specifications do not comply with the codes or regulations, Contractor shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, Contractor shall submit with the proposal a separate price to make the system comply with the codes and regulations.
6. All changes to the system made after letting of the contract, to comply with codes or requirements of Inspectors, shall be made by the Contractor without cost to the Owner.
7. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.
8. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.

D. Permits, Fees, Taxes, Inspections:

1. Procure all applicable permits and licenses.

2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
3. Pay all charges for permits or licenses.
4. Pay all fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
5. Pay all charges arising out of required inspections by an authorized body.
6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
7. Where applicable, all fixtures, equipment and materials shall be listed by Underwriters' Laboratories, Inc. and approved by FM Global.

E. Utility Company Requirements:

1. Secure from the appropriate private or public utility company all applicable requirements.
2. Comply with all utility company requirements.
3. Make application for and pay for service connections, such as sewer and water and gas.
4. Make application for and pay for all meters and metering systems required by the utility company.

F. Examination of Drawings:

1. The drawings for the plumbing work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of pipes and ducts to best fit the layout of the job.
3. Scaling of the drawings is not sufficient or accurate for determining these locations.
4. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
5. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
6. If an item is either on the drawings or in the specifications, it shall be included in this contract.
7. Determination of quantities of material and equipment required shall be made by the Contractor from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater number shall govern.
8. Where used in mechanical documents, the word "furnish" shall mean supply for use, the word "install" shall mean connect complete and ready for operation, and the word "provide" shall mean to supply for use and connect complete and ready for operation.

    a. Any item listed as furnished shall also be installed, unless otherwise noted.
    b. Any item listed as installed shall also be furnished, unless otherwise noted.

G. Field Measurements:

1. Verify all pertinent dimensions at the job site before ordering any materials or fabricating any supports, pipes or ducts.

H. Electronic Media/Files:

1. Construction drawings for this project have been prepared utilizing Revit.
2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by IMEG.
4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.
5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
6. The drawings prepared by IMEG for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.
7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.
8. The information is provided to expedite the project and assist the Contractor with no guarantee by IMEG as to the accuracy or correctness of the information provided. IMEG accepts no responsibility or liability for the Contractor's use of these documents.

1.6 SUBMITTALS

A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

1. Submittals List:

Referenced Specification Section	Submittal Item
22 05 00	Owner Training Agenda
22 05 13	Motors
22 05 29	Hangers and Supports
22 05 29	Prefabricated Curbs
22 05 50	Seismic Restraint Systems
22 05 53	Plumbing Identification
22 07 19	Plumbing Pipe Insulation
22 10 00	Plumbing Piping Systems and Valves
22 10 23	Natural Gas and Propane Piping Systems
22 10 30	Plumbing Specialties
22 11 23	Domestic Water Pumps
22 30 00	Plumbing Equipment

Referenced Specification Section	Submittal Item
22 40 00	Plumbing Fixtures

B. General Submittal Procedures: In addition to the provisions of Division 1, the following are required:

1. Transmittal: Each transmittal shall include the following:

   a. Date
   b. Project title and number
   c. Contractor's name and address
   d. Division of work (e.g., plumbing, heating, ventilating, etc.)
   e. Description of items submitted and relevant specification number
   f. Notations of deviations from the contract documents
   g. Other pertinent data

2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:

   a. Date
   b. Project title and number
   c. Architect/Engineer
   d. Contractor and subcontractors' names and addresses
   e. Supplier and manufacturer's names and addresses
   f. Division of work (e.g., plumbing, heating, ventilating, etc.)
   g. Description of item submitted (using project nomenclature) and relevant specification number
   h. Notations of deviations from the contract documents
   i. Other pertinent data
   j. Provide space for Contractor's review stamps

3. Composition:

   a. Submittals shall be submitted using specification sections and the project nomenclature for each item.
   b. Individual submittal packages shall be prepared for items in each specification section. All items within a single specification section shall be packaged together where possible. An individual submittal may contain items from multiple specifications sections if the items are intimately linked (e.g., pumps and motors).
   c. All sets shall contain an index of the items enclosed with a general topic description on the cover.

4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; electrical power criteria (e.g., voltage, phase, amps, horsepower, kW, etc.) wiring and control diagrams; Short Circuit Current Rating (SCCR); dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
5. Contractor's Approval Stamp:

    a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
    b. Unstamped submittals will be rejected.
    c. The Contractor's review shall include, but not be limited to, verification of the following:

        1) Only approved manufacturers are used.
        2) Addenda items have been incorporated.
        3) Catalog numbers and options match those specified.
        4) Performance data matches that specified.
        5) Electrical characteristics and loads match those specified.
        6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
        7) Dimensions and service clearances are suitable for the intended location.
        8) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
        9) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).

    d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.
    e. The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.

6. Submittal Identification and Markings:

    a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
    b. The Contractor shall clearly indicate the size, finish, material, etc.
    c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
    d. All marks and identifications on the submittals shall be unambiguous.

7. Schedule submittals to expedite the project. Coordinate submission of related items.
8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.
9. Reproduction of contract documents alone is not acceptable for submittals.
10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Architect/Engineer.
11. Submittals not required by the contract documents may be returned without review.
12. The Architect/Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Architect/Engineer to recheck and handle the additional shop drawing submittals.
13. Submittals shall be reviewed and approved by the Architect/Engineer **before** releasing any equipment for manufacture or shipment.
14. Contractor's responsibility for errors, omissions or deviation from the contract documents in submittals is not relieved by the Architect/Engineer's approval.
15. Schedule shall allow for adequate time to perform orderly and proper review of submittals, including time for consultants and Owner if required, and resubmittals by Contractor if necessary, and to cause no delay in Work or in activities of Owner or other contractors.

    a. Allow at least two weeks for Architect's/Engineer's review and processing of each submittal.

16. Architect/Engineer reserves the right to withhold action on a submittal which, in the Architect/Engineer's opinion, requires coordination with other submittals until related submittals are received. The Architect/Engineer will notify the Contractor, in writing, when they exercise this right.

C. Electronic Submittal Procedures:

1. Distribution: Email submittals as attachments to all parties designated by the Architect/Engineer, unless a web-based submittal program is used.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. Submittal file name: 22 XX XX.description.YYYYMMDD
    b. Transmittal file name: 22 XX XX.description.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.

1.7 SCHEDULE OF VALUES

A. The requirements herein are in addition to the provisions of Division 1.

B. Format:

1. Use AIA Document Continuation Sheets G703 or another similar form approved by the Owner and Architect/Engineer.
2. Submit in Excel format.
3. Support values given with substantiating data.

C. Preparation:

1. Itemize work required by each specification section and list all providers. All work provided by subcontractors and major suppliers shall be listed on the Schedule of Values. List each subcontractor and supplier by company name.
2. Break down all costs into:

    a. Material: Delivered cost of product with taxes paid.
    b. Labor: Labor cost, excluding overhead and profit.

3. Itemize the cost for each of the following:

    a. Overhead and profit.
    b. Bonds.
    c. Insurance.
    d. General Requirements: Itemize all requirements.

4. For each line item having an installed cost of more than $5,000, break down costs to list major products or operations under each item. At a minimum, provide material and labor cost line items for the following:

    a. Excavation and backfill for underground piping systems inside the building.
    b. Underground piping systems inside the building (sanitary, storm, etc.) listed separately. Break down the material and labor for each piping system based on geography (building, floor, wing and/or phase).
    c. Each aboveground piping system (sanitary, storm, domestic water, etc.). Break down the material and labor for each piping system based on geography (building, floor, wing and/or phase).
    d. Pipe insulation with separate material and labor line items for each piping system listed above.
    e. Each piece of equipment requiring shop drawings (e.g., backflow preventer, water heater, water softener, etc.) using the project nomenclature (BFP-1, WH-1, WS-1, etc.).
    f. Each plumbing fixture (e.g., WC, lavatory, sink, etc.). Multiple units of the same type can be listed together, provided quantities are also listed so unit costs can be determined.
    g. Site utilities (5' beyond building)
    h. Seismic design
    i. Water balancing
    j. Commissioning

k. Record drawings
l. Punchlist and closeout

D. Update Schedule of Values when:

1. Indicated by Architect/Engineer.
2. Change of subcontractor or supplier occurs.
3. Change of product or equipment occurs.

1.8 CHANGE ORDERS

A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders shall be broken down by sheet or associated individual line item indicated in the change associated narrative, whichever provides the most detailed breakdown. Change orders with inadequate breakdown will be rejected.

B. Itemized pricing with unit cost shall be provided from all distributors and associated subcontractors.

C. Change order work shall not proceed until authorized.

1.9 EQUIPMENT SUPPLIERS' INSPECTION

A. The following equipment shall not be placed in operation until a competent installation and service representative of the manufacturer has inspected the installation and certified that the equipment is properly installed, adjusted and lubricated; that preliminary operating instructions have been given; and that the equipment is ready for operation:

1. Fire Seal Systems
2. Seismic Restraints and Equipment Bracing

B. Contractor shall arrange for and obtain supplier's on-site inspection(s) at proper time(s) to assure each phase of equipment installation and/or connection is in accordance with the manufacturer's instructions.

C. Submit copies of start-up reports to the Architect/Engineer and include copies of Owner's Operation and Maintenance Manuals.

1.10 PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE

A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage. Keep materials clean, dry and free from harmful conditions. Immediately remove any materials that become wet or that are suspected of becoming contaminated with mold or other organisms.

B. Keep all bearings properly lubricated and all belts properly tensioned and aligned.

C. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Mechanical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.

D. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate the work with other trades.

1.11 NETWORK / INTERNET CONNECTED EQUIPMENT

A. These specifications may require certain equipment or systems to have network, Internet and/or remote access capability ("Network Capability"). Any requirement for Network Capability shall be interpreted only as a functional capability and is not to be construed as authority to connect or enable any Network Capability. Network Capability may only be connected or enabled with the express written consent of the Owner.

1.12 WARRANTY

A. Provide one-year warranty, unless otherwise noted, to the Owner for all fixtures, equipment, materials, and workmanship.

B. The warranty period for all work in this Division of the specifications shall commence on the date of final acceptance, unless a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.

C. Warranty requirements shall extend to correction, without cost to the Owner, of all Work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage resulting from defects or nonconformance with contract documents.

1.13 INSURANCE

A. Contractor shall maintain insurance coverage as set forth in Division 0 of these specifications.

1.14 MATERIAL SUBSTITUTION

A. Where several manufacturers’ names are given, the first manufacturer is the basis for job design and establishes the quality.

B. Equivalent equipment manufactured by the other listed manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications and fits in the allocated space. When using other listed manufacturers, the Contractor shall assume responsibility for any and all modifications necessary (including, but not limited to structural supports, electrical connections, piping and ductwork connections and arrangement, plumbing connections and rough-in, and regulatory agency approval, etc.) and coordinate such with other contractors.

C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer not later than ten days prior to the bid opening.

D. This Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on the Contractor's part or on the part of other Contractors whose work is affected.

E. This Contractor may list voluntary add or deduct prices for alternate materials on the bid form. These items will not be used in determining the low bidder.

F. All material substitutions requested later than ten (10) days prior to bid opening must be listed as voluntary changes on the bid form.

1.15 PROJECT COMMISSIONING

A. The Contractor shall work with the Commissioning Agent (CxA) as described in Section 01 91 00 and provide all services as described in the Commissioning Plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 JOBSITE SAFETY

A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or the employees and subconsultants at a construction site, shall relieve the Contractor and other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.2 EXCAVATION, FILL, BACKFILL, COMPACTION

A. General:

1. Prior to the commencement of any excavation or digging, the Contractor shall verify all underground utilities with the regional utility locator. Provide prior notice to the locator before excavations. Contact information for most regional utility locaters can be found at the following website (https://call811.com/) or by calling 811.
2. The Contractor shall do all excavating, filling, backfilling and compacting associated with the work.

B. Excavation:

1. Make all excavations to accurate, solid, undisturbed earth, and to proper dimensions.
2. Where excavations are made in error below foundations, concrete of same strength as specified for the foundations or thoroughly compacted sand-gravel fill, as determined by the Architect/Engineer, shall be placed in such excess excavations. Place thoroughly compacted, clean, stable fill in excess excavations under slabs on grade, at the Contractor's expense.
3. Trim bottom and sides of excavations to grades required for foundations.
4. Protect excavations against frost and freezing.
5. Take care in excavating not to damage surrounding structures, equipment, or buried pipe. Do not undermine footing or foundation.
6. Perform all trenching in a manner to prevent cave-ins and risk to workers.
7. Where original surface is pavement or concrete, the surface shall be saw cut to provide clean edges and assist in the surface restoration.
8. Where satisfactory bearing soil for foundations is not found at the indicated levels, the Architect/Engineer or their representative shall be notified immediately, and no further work shall be done until further instructions are given by the Architect/Engineer or their representative.

C. Dewatering:

1. Contractor shall furnish, install, operate, and remove all dewatering pumps and pipes needed to keep trenches and pits free of water.

D. Underground Obstructions:

1. Known underground piping, foundations, and other obstructions in the vicinity of construction are shown on the drawings. Use great care in making installations near underground obstruction.
2. If objects not shown on the drawings are encountered, remove, relocate, or perform extra work as directed by the Architect/Engineer.

E. Fill and Backfilling:

1. Utilities Bedding: Lay underground utilities on minimum of 6"sand bedding or CA6 crushed stone. Compact bedding under utilities smooth, with no sharp edges protruding, to protect the utilities from puncture. Shape bedding to provide continuous support for bells, joints, and barrels of utilities and for joints and fittings.
2. Envelope around utilities to 6" above utilities: Place and compact sand or CA6 to a height of 6" over utilities in 6" layers. Each layer shall be placed, then carefully and uniformly tamped, to eliminate lateral or vertical displacement. After connection joints are made, any misalignment can be corrected by tamping backfill around the utilities.
3. Backfill from 6" above utilities to earthen grade: Place all backfill materials above the utilities in uniform layers not exceeding 6" deep. Each layer shall be placed, then carefully and uniformly tamped, to eliminate lateral or vertical displacement.
4. Backfill from 6" above utilities to below slabs or paved area: Where the fill and backfill will ultimately be under a building, floor or paving, each layer of backfill materials shall be compacted to 95% of the maximum density determined by AASHTO Designation T 99 or ASTM Designation D 698. Moisture content of soil at time of compaction shall not exceed plus or minus 2% of optimum moisture content determined by AASHTO T 99 or ASTM D 698 test.
5. Backfill Materials: Native soil materials may be used as backfill if approved by the Geotechnical Engineer. Backfill material shall be free of rock or gravel larger than 3" in any dimension and shall be free of debris, waste, frozen materials, vegetation, high void content, and other deleterious materials. Water shall not be permitted to rise in unbackfilled trenches.
6. Dispose of excess excavated earth as directed.
7. Backfill all trenches and excavations immediately after installing utilities or removal of forms, unless other protection is provided.
8. Around piers and isolated foundations and structures, backfill and fill shall be placed and consolidated simultaneously on all sides to prevent wedge action and displacement. Fill and backfill materials shall be spread in 6 inch uniform horizontal layers with each layer compacted separately to required density.

F. Surface Restoration:

1. Where trenches are cut through existing graded, planted, or landscaped areas, the areas shall be restored to the original condition. Replace all planting removed or damaged to its original condition. A minimum of 6 inches of topsoil shall be applied where disturbed areas are to be seeded or sodded.
2. Concrete or asphalt type pavement, seal coat, rock, gravel or earth surfaces removed or damaged shall be replaced with comparable materials and restored to original condition.

3.3 ARCHITECT/ENGINEER OBSERVATION OF WORK

A. The Contractor shall provide seven (7) calendar days' notice to the Architect/Engineer prior to:

1. Placing fill over underground and underslab utilities.
2. Covering exterior walls, interior partitions and chases.
3. Installing hard or suspended ceilings and soffits.

B. The Architect/Engineer will have the opportunity to review the installation and provide a written report noting deficiencies requiring correction. The Contractor's schedule shall account for these reviews and show them as line items in the approved schedule.

C. Above-Ceiling Final Observation

1. All work above the ceilings must be complete prior to the Architect/Engineer's review. This includes, but is not limited to:

   a. Pipe insulation is installed and fully sealed.
   b. Pipe wall penetrations are sealed.
   c. Pipe identification and valve tags are installed.

2. In order to prevent the Above-Ceiling Final Observation from occurring too early, the Contractor shall review the status of the work and certify, in writing, that the work is ready for the Above-Ceiling Final Observation.
3. It is understood that if the Architect/Engineer finds the ceilings have been installed prior to this review and prior to 7 days elapsing, the Architect/Engineer may not recommend further payments to the contractor until such time as full access has been provided.

3.4 PROJECT CLOSEOUT

A. The following paragraphs supplement the requirements of Division 1.

B. Final Jobsite Observation:

1. In order to prevent the Final Jobsite Observation from occurring too early, the Contractor is required to review the completion status of the project and certify that the job is ready for the final jobsite observation.
2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review.
3. Upon Contractor certification that the project is complete and ready for a final observation, the Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.
4. It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineer's additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

C. Before final payment is authorized, this Contractor must submit the following:

1. Operation and maintenance manuals with copies of approved shop drawings.
2. Record documents including marked-up or reproducible drawings and specifications.
3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of This Contractor and shall be signed by the Owner's representatives.

4. Start-up reports on all equipment requiring a factory installation inspection or start-up.
5. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site and place in location as directed; receipt by Architect/Engineer required prior to final payment approval.

3.5 OPERATION AND MAINTENANCE MANUALS

A. General:

1. Provide an electronic copy of the O&M manuals as described below for Architect/Engineer's review and approval. The electronic copy shall be corrected as required to address the Architect/Engineer's comments. Once corrected, electronic copies and paper copies shall be distributed as directed by the Architect/Engineer.
2. Approved O&M manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.

B. Electronic Submittal Procedures:

1. Distribution: Email the O&M manual as attachments to all parties designated by the Architect/Engineer.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. O&M file name: O&M.div22.contractor.YYYYMMDD
    b. Transmittal file name: O&Mtransmittal.div22.contractor.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.
6. Provide the Owner with an approved copy of the O&M manual on compact discs (CD), digital video discs (DVD), or flash drives with a permanently affixed label, printed with the title "Operation and Maintenance Instructions", title of the project and subject matter of disc/flash drive when multiple disc/flash drives are required.
7. All text shall be searchable.
8. Bookmarks shall be used, dividing information first by specification section, then systems, major equipment and finally individual items. All bookmark titles shall include the nomenclature used in the construction documents and shall be an active link to the first page of the section being referenced.

C. Operation and Maintenance Instructions shall include:

1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all subcontractors, and major equipment suppliers, with addresses, telephone numbers, website addresses, email addresses and point of contacts. Website URLs and email addresses shall be active links in the electronic submittal.
2. Table of Contents: Include a table of contents describing specification section, systems, major equipment, and individual items.
3. Copies of all final approved shop drawings and submittals. Include Architect's/Engineer's shop drawing review comments. Insert the individual shop drawing directly after the Operation and Maintenance information for the item(s) in the review form.
4. Copy of final approved test and balance reports.
5. Copies of all factory inspections and/or equipment startup reports.
6. Copies of warranties.
7. Schematic electrical power/controls wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
8. Dimensional drawings of equipment.
9. Capacities and utility consumption of equipment.
10. Detailed parts lists with lists of suppliers.
11. Operating procedures for each system.
12. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
13. Repair procedures for major components.
14. List of lubricants in all equipment and recommended frequency of lubrication.
15. Instruction books, cards, and manuals furnished with the equipment.
16. Owner and Contractor attendance list for domestic water systems operation, maintenance, and flushing training.

3.6 INSTRUCTING THE OWNER'S REPRESENTATIVES

A. Adequately instruct the Owner's designated representatives in the maintenance, care, and operation of all systems installed under this contract.

B. Provide verbal and written instructions to the Owner's representatives by FACTORY PERSONNEL in the care, maintenance, and operation of the equipment and systems.

C. Contractor shall make a DVD video recording of instructions to the Owner while explaining the system so additional personnel may view the instructions at a later date. The video recording shall be the property of the Owner.

D. The Owner has the option to make a video recording of all instructions. Coordinate schedule of instructions to facilitate this recording.

E. The instructions shall include:

1. Explanation of all system flow diagrams.
2. Maintenance of equipment.
3. Start-up procedures for all major equipment.
4. Explanation of seasonal system changes.

5. Explanation of Owner’s Responsibilities to operate, maintain, and flush domestic water system (i.e., ASHRAE Standard 188).

F. Notify the Architect/Engineer of the time and place for the verbal instructions to be given to the Owner's representative so a representative can attend if desired.

G. Minimum hours of instruction for each item shall be:

1. Domestic Hot Water System - 4 hours
2. All Domestic Water Systems operation, maintenance and flushing of all fixtures and dead legs - 4 hours

H. The Contractor shall prepare a detailed, written training agenda and submit it to the Architect/Engineer a minimum of two weeks prior to the formal training for approval. The written agenda shall include specific training points within the items described above. For example: how to adjust setpoints, troubleshooting, proper start-up, proper shut-down, seasonal changes, draining, venting, changing filters, changing belts, etc. Failure to provide and follow an approved training agenda may result in additional training required at the expense of the Contractor.

I. Operating Instructions:

1. Contractor is responsible for all instructions to the Owner's representatives for the mechanical and control systems.
2. If the Contractor does not have staff that can adequately provide the required instructions the Contractor shall include in the bid an adequate amount to reimburse the Owner for the Architect/Engineer to perform these services.

3.7 SYSTEM STARTING AND ADJUSTING

A. The plumbing systems shall be complete and operating. System startup, testing, adjusting, and balancing to obtain satisfactory system performance is the responsibility of the Contractor. This includes calibration and adjustments of all controls, noise level adjustments and final adjustments as required.

B. Complete all manufacturer-recommended startup procedures and checklists to verify proper motor rotation, electrical power voltage is within equipment limitations, equipment controls maintain pressures and temperatures within acceptable ranges, all filters and protective guards are in-place, acceptable access is provided for maintenance and servicing, and equipment operation does not pose a danger to personnel or property.

C. Contractor shall adjust the plumbing systems and controls at season changes during the one year warranty period, as required, to provide satisfactory operation and to prove performance of all systems in all seasons.

D. All operating conditions and control sequences shall be tested during the start-up period. Test all interlocks, safety shutdowns, controls, and alarms.

E. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to ensure that all systems perform properly. If the Architect/Engineer is requested to visit the job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period, through no fault of the design; the Contractor shall reimburse the Owner on a time and materials basis for services rendered at the Architect/Engineer's standard hourly rates in effect when the services are requested. The Contractor shall pay the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

3.8 RECORD DOCUMENTS

A. The following paragraphs supplement Division 1 requirements.

B. Maintain at the job site a separate and complete set of plumbing drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.

C. Mark drawings to indicate revisions to piping size and location, both exterior and interior; including locations devices, requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned from column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located; Change Orders; concealed control system devices.

D. Before completion of the project, a set of reproducible plumbing drawings will be given to the Contractor for transfer of all as-built conditions from the paper set maintained at the job site. All marks on reproducibles shall be clear and permanent.

E. Mark specifications to show approved substitutions; Change Orders, and actual equipment and materials used.

F. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.

G. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

3.9 PAINTING

A. This Contractor shall paint the following items:

1. All piping in mechanical room
2. Piping exposed in kitchen

B. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available.

C. Equipment in finished areas that will be painted to match the room decor will be painted by others. Should this Contractor install equipment in a finished area after the area has been painted, the Contractor shall have the equipment and all its supports, hangers, etc., painted to match the room decor.

D. Equipment cabinets, casings, covers, metal jackets, etc., in equipment rooms or concealed spaces, shall be furnished in standard or prime finish, free from scratches, abrasions, chips, etc.

E. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with baked enamel finish coat free from scratches, abrasions, chips, etc. If color option is specified or is standard to the unit, this Contractor shall, before ordering, verify with the Architect/Engineer the color preference and furnish this color.

F. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, storage room, etc., furnished by this Contractor. Equipment furnished with a factory coat of paint and enamel need not be painted, provided the factory applied finish is not marred or spattered. If so, equipment shall be refinished with the same paint as was factory applied.

G. Paint all outdoor uninsulated steel piping the color selected by Owner or Architect/Engineer.

H. Paint all outdoor exposed natural gas piping the color selected by Owner or Architect/Engineer.

I. After surfaces have been thoroughly cleaned and are free of oil, dirt, and other foreign matter; paint all pipes and equipment with the following:

1. Bare Metal Surfaces - Apply one coat of primer suitable for the metal being painted. Finish with two coats of Alkyd base enamel paint.
2. Insulated Surfaces - Paint insulation jackets with two coats of semi-gloss acrylic latex paint.
3. Color of paint shall be as follows:

    a. All piping in mechanical room:

        1) Domestic Cold Water: Blue pipe/white letters
        2) Domestic Hot Water: Red pipe/white letters
        3) Sanitary Waste: Green pipe/black letters
        4) Natural Gas: Yellow pipe/black letters

    b. Piping exposed in kitchen:

        1) All Piping: White

3.10 ADJUST AND CLEAN

A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project. Clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material from all equipment.

B. Clean all areas where moisture is present. Immediately report any mold, biological growth, or water damage.

C. Remove all rust, scale, dirt, oils, stickers and thoroughly clean exterior of all exposed piping, hangers, and accessories.

D. Remove all rubbish, debris, etc., accumulated during construction from the premises.

3.11 SPECIAL REQUIREMENTS

A. Contractor shall coordinate the installation of all equipment, valves, dampers, operators, etc., with other trades to maintain clear access area for servicing.

B. All equipment shall be installed in such a way to maximize access to parts needing service or maintenance. Review the final field location, placement, and orientation of equipment with the Owner's designated representative prior to setting equipment.

C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's designated representative will result in removal and reinstallation of the equipment at the Contractor's expense.

3.12 IAQ MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION

A. Contractors shall make all reasonable efforts to prevent construction activities from affecting the air quality of the occupied areas of the building or outdoor areas near the building. These measures shall include, but not be limited to:

1. All contractors shall endeavor to minimize the amount of contaminants generated during construction. Methods to be employed shall include, but not be limited to:

    a. Minimizing the amount of dust generated.
    b. Reducing solvent fumes and VOC emissions.
    c. Maintain good housekeeping practices, including sweeping and periodic dust and debris removal. There should be no visible haze in the air.
    d. Protect stored on-site and installed absorptive materials from moisture damage.

2. Request that the Owner designate an IAQ representative.
3. Review and receive approval from the Owner's IAQ representative for all IAQ-related construction activities and negative pressure containment plans.
4. Inform the IAQ representative of all conditions that could adversely impact IAQ, including operations that will produce higher than normal dust production or odors.
5. Schedule activities that may cause IAQ conditions that are not acceptable to the Owner's IAQ representative during unoccupied periods.
6. Request copies of and follow all of the Owner's IAQ and infection control policies.
7. Unless no other access is possible, the entrance to construction site shall not be through the existing facility.
8. To minimize growth of infectious organisms, do not permit damp areas in or near the construction area to remain for over 24 hours.

9. In addition to the criteria above, provide measures as recommended in the SMACNA "IAQ Guidelines for Occupied Buildings Under Construction".

3.13 UTILITY REBATE

A. Submit utility rebate forms, where offered at project location, with rebate items completed. Rebate may include lighting, lighting controls, variable speed drives, heat pumps, package terminal A/C, air conditioners, chillers, water heaters, programmable thermostats, and motors.

1. Contractor must submit notification of any value engineering or product substitution that will affect the utility rebate amount prior to approval.

READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

To prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to your requesting a final job observation.
1. Penetrations fire sealed and labeled in accordance with specifications.
2. All pumps operating and balanced.
3. All plumbing fixtures installed and caulked.
4. Pipe insulation complete, pipes labeled and valves tagged.
5. Owner and Contractor attendance list for domestic water systems operation, maintenance, and flushing training.

Accepted by:

Prime Contractor _____

By _____ Date _____

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Architect/Engineer so that the final observation can be scheduled.

It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

END OF SECTION 22 05 00

SECTION 22 05 13 - MOTORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Single Phase and Three Phase Electric Motors.

1.2 SUBMITTALS

A. Submit shop drawings under provisions of Section 22 05 00. Include nominal efficiency and power factor for all premium efficiency motors. Efficiencies must meet or exceed the nominal energy efficiency levels presented below.

B. Submit shop drawings for all three phase motors.

C. Submit motor data with equipment when motor is installed by the manufacturer at the factory.

D. Submit for all motors as required.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weatherproof coverings. For extended outdoor storage, follow manufacturer's recommendations for equipment and motor.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data including assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of commercial and industrial motors and accessories, with a minimum of three years documented manufacturing experience.

PART 2 - PRODUCTS

2.1 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Refer to the drawings for required electrical characteristics. Voltage is generally specified and scheduled as distribution voltage. Motor submittals may be based on utilization voltage if it corresponds to the correct distribution voltage.

Distribution/Nominal Voltage	Utilization Voltage
120	115

208	200
240	230
277	265
480	460

B. Design motors for continuous operation in 40ºC environment, and for temperature rise in accordance with ANSI/NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

C. Visible Nameplate: Indicating horsepower, voltage, phase, hertz, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, insulation class.

D. Electrical Connection: Boxes, threaded for conduit. For fractional horsepower motors where connection is made directly, provide conduit connection in end frame.

E. Unless otherwise indicated, motors 3/4 HP and smaller shall be single phase, 60 hertz, open drip-proof or totally enclosed fan-cooled type.

F. Unless otherwise indicated, motors 1 HP and larger shall be three phase, 60 hertz, squirrel cage type, NEMA Design Code B (low current in-rush, normal starting torque), open drip-proof or totally enclosed fan-cooled type.

G. Each contractor shall set all motors furnished by him.

H. All motors shall have a minimum service factor of 1.15.

I. All motors shall have ball or roller bearings with a minimum L-10 fatigue life of 150,000 hours in direct-coupled applications and 50,000 hours for belted applications. Belted rating shall be based on radial loads and pulley sizes called out in NEMA MG1-14.43.

J. Bearings shall be sealed type for 10 HP and smaller motors. Bearings shall be regreasable type for larger motors.

K. Aluminum end housings are not permitted on motors 15 HP or larger.

L. Motor Driven Equipment:

1. No equipment shall be selected or operate above 90% of its motor nameplate rating. Motor size may not be increased to compensate for equipment with efficiency lower than that specified.
2. If a larger motor than specified is required on equipment, the contractor supplying the equipment is responsible for all additional costs due to larger starters, wiring, etc.

M. Provide all belted motors with a means of moving and securing the motor to tighten belts. Motors over 2 HP shall have screw type tension adjustment. Motors over 40 HP shall have dual screw adjusters. Slide bases shall conform to NEMA standards.

N. Motors for pumps 1/12 HP or greater and less than 1 HP shall be electronically-commutated motors or shall have a minimum motor efficiency of 70% when rated in accordance with DOE 10 CFR 431. These motors shall also have the means to adjust motor speed for either balancing or remote control.

2.2 ELECTRICALLY COMMUTATED MOTORS (ECM)

A. Motor shall be variable speed, constant torque, brushless DC motor for direct-drive applications. Electronics shall be encapsulated for moisture protection and shall integral surge protection. Motor shall be pre-wired for specific voltage and phase.

B. Motor frame shall be NEMA 48; UL recognized components shall be provided for the motor construction.

C. All EC motors shall be a minimum of 85% efficient at all speeds.

D. Motors shall be permanently lubricated; utilize ball bearings to match with the connected driven equipment.

E. Provide motor with onboard motor control module. Motor speed shall be limited to provide electronic over current protection. Starter shall provide soft start to reduce inrush current and shall be controllable from 20% to 100% of full rated speed.

F. Operational mode shall be as scheduled and shall be one of the following:

1. Constant Flow
2. Constant Temperature
3. Constant Pressure

2.3 PREMIUM EFFICIENCY MOTORS (INCLUDING MOST 3-PHASE GENERAL PURPOSE MOTORS)

A. All motors, unless exempted by EPAct legislation that became federal law on December 19, 2010, shall comply with the efficiencies listed in that standard, which are reprinted below. These match the 2010 NEMA premium efficiency ratings. All ratings listed are nominal full load efficiencies, verified in accordance with IEEE Standard 112, Test Method B. Average expected (not guaranteed minimum) power factors shall also be at least the following:

	Full-Load Efficiencies %					
	Open Drip-Proof			Totally Enclosed Fan Cooled		
HP	1200 rpm	1800 rpm	3600 rpm	1200 rpm	1800 rpm	3600 rpm
1.0	82.5	85.5	77.0	82.5	85.5	77.0
1.5	86.5	86.5	84.0	87.5	86.5	84.0
2.0	87.5	86.5	85.5	88.5	86.5	85.5
3.0	88.5	89.5	85.5	89.5	89.5	86.5
5.0	89.5	89.5	86.5	89.5	89.5	88.5
7.5	90.2	91.0	88.5	91.0	91.7	89.5
10.0	91.7	91.7	89.5	91.0	91.7	90.2

B. Motor nameplate shall be noted with the above ratings.

2.4 SHEAVES

A. All sheaves shall conform to NEMA Standard MG1-14.42, which lists minimum diameters and maximum overhangs. Locate motors to minimize overhang.

B. When replacing sheaves, use sheaves of at least the originally supplied sizes.

C. Contractor responsible for motor shall also be responsible for replacement sheaves. Coordinate with testing and balancing of the equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.

B. For flexible coupled drive motors, mount coupling to the shafts in accordance with the coupling manufacturer's recommendations. Align shafts to manufacturer's requirements or within 0.002 inch per inch diameter of coupling hub.

C. For belt drive motors, mount sheaves on the appropriate shafts per manufacturer's instructions. Use a straight edge to check alignment of the sheaves. Reposition sheaves as necessary so the straight edge contacts both sheave faces squarely. After sheaves are aligned, loosen the adjustable motor base so the belt(s) can be added, and tighten the base so the belt tension is in accordance with the drive manufacturer's recommendations. Frequently check belt tension and adjust if necessary during the first day of operation and again after 80 hours of operation.

END OF SECTION 22 05 13

SECTION 22 05 29 - PLUMBING SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Hangers, Supports, and Associated Anchors.

B. Equipment Bases and Supports.

C. Flashing and Sealing of Equipment and Pipe Stacks.

D. Cutting of Openings.

E. Escutcheon Plates and Trim.

1.2 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 22 05 00. Include plastic pipe manufacturers' support spacing requirements.

1.3 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Furnish sleeves and hanger inserts to General Contractor for placement into formwork.

PART 2 - PRODUCTS

2.1 SEISMIC RESTRAINTS

A. Refer to Section 22 05 50 for additional requirements for seismic restraints.

2.2 HANGER RODS

A. Hanger rods for single rod hangers shall conform to the following:

	Hanger Rod Diameter	
Pipe Size	Column #1	Column #2
2-1/2" and smaller	3/8"	3/8"
3" through 3-5/8"	3/8"	3/8"
4" and 5"	1/2"	1/2"
6"	3/4"	5/8"
8" through 12"	7/8"	3/4"

Column #1: Steel, cast iron, and glass pipe.
Column #2: Copper and plastic pipe.

B. Rods for double rod hangers may be reduced one size. Minimum rod diameter is 3/8 inches.

C. Hanger rods and accessories used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.

D. All hanger rods, nuts, washers, clevises, etc., in damp areas shall have ASTM A123 hot-dip galvanized finish applied after fabrication. This applies to the following areas:

2.3 PIPE AND STRUCTURAL SUPPORTS

A. General:

1. Pipe hangers, clamps, and supports shall conform to Manufacturers Standardization Society MSS SP-58, 69, 89, and 127 (where applicable).
2. On all insulated piping, provide at each support an insert of same thickness and contour as adjoining insulation, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. Refer to insulation specifications for materials and additional information.

3. Copper piping located in an exposed area, including indirect waste piping in kitchens and janitor's closets, shall use split ring standoff hangers for copper tubing. Support shall include plastic pipe insert similar to Unistrut Cush-A-Clamp, Hydra-Zorb, Erico Cushion Clamp or Cooper Vibra-Clamp. Use electro-galvanized or more corrosion resistant and threaded rod for floor applications. Use anchors applicable to the wall type with corrosion resistant threaded rod for wall applications.

a. Products:

1) Erico/M-Co Model #456
2) B-Line Fig. 3198HCT
3) Anvil Fig. CT138R
4) Nibco/Tolco Fig. 301CT

B. Vertical Supports:

1. Support and laterally brace vertical pipes at every floor level in multi-story structures, unless otherwise noted by applicable codes, but never at intervals over 15 feet Support vertical pipes with riser clamps installed below hubs, couplings, or lugs. Provide sufficient flexibility to accommodate expansion and contraction to avoid compromising fire barrier penetrations or stressing piping at fixed takeoff locations.

a. Products:

1) Cooper/B-Line Fig B3373 Series
2) Erico 510 Series
3) Nibco/Tolco Fig. 82

2. Cold Pipe: Place restrained neoprene mounts beneath vertical pipe riser clamps to prevent sweating of cold pipes. Select neoprene mounts based on the weight of the pipe to be supported. Insulate over mounts.

a. Products:

1) Mason RBA, RCA or RDA
2) Mason BR

3. Cold Pipe Alternative: Insulated pipe riser clamp with no thermal bridging between clamp and pipe; water repellant calcium silicate insulation material adhered inside the clamp; ASTM A653 galvanized steel clamp.

a. Products:

1) Pipeshields E100

4. Wall supports shall be used where vertical height of structure exceeds minimum spacing requirements. Install wall supports at same spacing as hangers or strut supports along vertical length of pipe runs. Wall supports shall be coordinated with the Structural Engineer.
5. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or self-tapping masonry screws. For expansion anchors into hollow concrete block, use sleeve-type anchors designed for the specific application. Do not fasten in masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic inserts.

C. Hangers and Clamps:

1. Oversize all hangers, clamps, and supports on insulated piping to allow insulation and jacket to pass through unbroken. This applies to both hot and cold pipes.
2. Hangers in direct contact with bare copper pipe shall include plastic pipe insert similar to Unistrut Cush-A-Clamp, Hydra-Zorb, Erico Cushion Clamp or Cooper Vibra-Clamp within their temperature limits of -65°F to +275°F.
3. Vertical cold pipe drops and rough-ins to fixtures shall be supported by insulated pipe clamps to prevent thermal bridging and condensation.
4. On all insulated piping, provide a semi-cylindrical metallic shield and vapor barrier jacket.
5. Ferrous hot piping 4 inches and larger shall have steel saddles tack welded to the pipe at each support with a depth not less than specified for the insulation. Factory fabricated inserts may be used.

a. Products:

1) Anvil Fig. 160, 161, 162, 163, 164, 165
2) Cooper/B-Line Fig. 3160, 3161, 3162, 3163, 3164, 3165.
3) Erico Model 630, 631, 632, 633, 634, 635.
4) Nibco/Tolco Fig. 260-1, 261-1 1/2, 262-2, 263-2 1/2, 264-3, 265-4

6. Unless otherwise indicated, hangers shall be as follows:

a. Clevis Type:

1) Service: Bare Metal Pipe, Rigid Plastic Pipe, Insulated Cold Pipe, Insulated Hot Pipe - 3 inches & Smaller

2) Products: Bare Steel Plastic or Insulated Pipe:

a) Anvil Fig. 260
b) Cooper/B-Line Fig. 3100
c) Erico Model 400
d) Nibco/Tolco Fig. 1

3) Products: Bare Copper Pipe:

a) Cooper/B-Line Fig. B3100C
b) Nibco/Tolco Fig. 81PVC

b. Padded Clevis Type:

1) Service: Glass Pipe
2) Hangers:

a) Anvil Fig. 260
b) Cooper/B-Line Fig. 3100
c) Erico Model 400
d) Nibco/Tolco Fig. 1l

3) Pads:

a) Anvil Fig. 3195

c. Continuous Channel with Clevis Type: Service: Plastic Tubing, Flexible Hose, Soft Copper Tubing:

1) Products:

a) Cooper/B-Line Fig. B3106, with Fig. B3106V
b) Erico Model 104, with Model 104V
c) Nibco/Tolco Fig. 1V

d. Adjustable Swivel Ring Type:

1) Service: Bare Metal Pipe - 4 inches and Smaller
2) Bare Steel Pipe:

a) Anvil Fig. 69
b) Cooper/B-Line Fig. B3170NF
c) Erico Model FCN
d) Nibco/Tolco Fig. 200

3) Bare Copper Pipe:

a) Cooper/B-Line Fig. B3170CTC
b) Erico 102A0 Series
c) Nibco/Tolco Fig. 203

7. Support may be fabricated from U-channel strut or similar shapes. Piping less than 4" in diameter shall be secured to strut with clamps of proper design and capacity as required to maintain spacing and alignment. Strut shall be independently supported from hanger drops or building structure. Size and support shall be per manufacturer's installation requirements for structural support of piping. Clamps shall not interrupt piping insulation.

    a. Strut used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.
    b. Strut used in damp areas listed in hanger rods shall have ASTM A123 hot-dip galvanized finish applied after fabrication.

8. Unless otherwise indicated, pipe supports for use with struts shall be as follows:

    a. Clamp Type:

        1) Service: Bare Metal Pipe, Rigid Plastic Pipe, Insulated Cold Pipe, Insulated Hot Pipe - 3 inches and smaller
        2) Clamps in direct contact with copper pipe shall include plastic pipe insert similar to Unistrut Cush-A-Clamp, Hydra-Zorb, Erico Cushion Clamp or Cooper Vibra-Clamp.
        3) Pipes subject to expansion and contraction shall have clamps oversized to allow limited pipe movement.
        4) Bare Steel, Plastic or Insulated Pipe:

            a) Unistrut Fig. P1100 or P2500
            b) Cooper/B-Line Fig. B2000 or B2400
            c) Nibco/Tolco Fig. A-14 or 2STR

        5) Bare Copper Pipe:

            a) Cooper/B-Line Fig. BVT

D. Upper (Structural) Attachments:

1. Unless otherwise shown, upper attachments for hanger rods or support struts shall be as follows:

    a. Steel Structure Clamps: C-Type Wide Flange Beam Clamps (for use on top and/or bottom of wide flanges. Not permitted for use with bar-joists.):

        1) Products:

            a) Anvil Fig. 92
            b) Cooper/B-Line Fig. B3033/B3034
            c) Erico Model 300
            d) Nibco/Tolco 68

b. Steel Structure Clamps: Scissor Type Beam Clamps (for use with bar-joists and wide flange):

1) Products:

a) Anvil Fig. 228, 292
b) Cooper/B-Line Fig. B3054
c) Erico Model 360
d) Nibco/Tolco Fig. 329

c. Concentrically Loaded Open Web Joist Hangers (for use with bar joists):

1) Products:

a) MCL. M1, M2 or M3

d. Concrete Anchors: Fasten to concrete using cast-in or post-installed anchors designed per the requirements of Appendix D of ACI 318-05. Post-installed anchors shall be qualified for use in cracked concrete by ACI-355.2.

e. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or self-tapping masonry screws. For expansion anchors into hollow concrete block, use sleeve-type anchors designed for the specific application. Do not fasten in masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic inserts.

f. Steel Structure Welding:

1) Unless otherwise noted, hangers, clips, and auxiliary support steel may be welded in lieu of bolting, clamping, or riveting to the building structural frame. Take adequate precautions during all welding operations for fire prevention and protecting walls and ceilings from smoke damage.

g. Wood Anchors: Tension wood rod hanger for suspending 3/8" threaded rod. Zinc plated carbon steel.

1) Minimum allowable tension loads for Douglass Fir/Southern Pine:

a) 3/8" diameter rod; 2-1/2" shank: 600 lb/590 lb.
b) Load values are based on full shank penetration into wood member. Minimum edge distance 3/4". Minimum end distance 3-1/4".

2) Limitations:

a) Truss: Do not hang from wood trusses without truss manufacturer or Structural Engineer’s approval.
b) Sheetrock/Gypsum Ceiling: When drilling through non-wood materials (e.g., sheet rock, gypsum, etc.), increase shank length by depth of non-wood materials.

c) Plywood Flooring/Roofing: Do not hang from plywood floor or roofing.
d) Spacing: Refer to wood structure spacing of hangers.

3) Products:

a) Simpson RWV
b) DeWALT
c) ITI Sammys GT25

2.4 FOUNDATIONS, BASES, AND SUPPORTS

A. Basic Requirements:

1. Furnish and install foundations, bases, and supports (not specifically indicated on the Drawings or in the Specifications of either the General Construction or Mechanical work as provided by another Contractor) for mechanical equipment.
2. All concrete foundations, bases and supports, shall be reinforced. All steel bases and supports shall receive a prime coat of zinc chromate or red metal primer. After completion of work, give steel supports a final coat of gray enamel.

B. Concrete Bases (Housekeeping Pads):

1. Refer to Section 22 05 50 for additional requirements for concrete bases in seismic applications.
2. Unless shown otherwise on the drawings, concrete bases shall be nominal 4 inches thick and shall extend 3 inches on all sides of the equipment (6 inches larger than factory base).
3. Where a base is less than 12 inches from a wall, extend the base to the wall to prevent a "dirt-trap".
4. Concrete materials and workmanship required for the Contractor's work shall be provided by the Contractor. Materials and workmanship shall conform to the applicable standards of the Portland Cement Association. Reinforce with 6"x6", W1.4-W1.4 welded wire fabric. Concrete shall withstand 3,000 pounds compression per square inch at 28 days.
5. Equipment requiring bases is as follows:

a. Expansion Tank
b. Pump
c. Water Heater

C. Supports:

1. Provide sufficient clips, inserts, hangers, racks, rods, and auxiliary steel to securely support all suspended material, equipment and conduit without sag.
2. Hang heavy equipment from concrete floors or ceilings with Architect/Engineer-approved concrete inserts, furnished and installed by the Contractor whose work requires them, except where indicated otherwise.

D. Grout:

1. Grout shall be non-shrinking premixed (Master Builders Company "Embecco"), unless otherwise indicated on the drawings or approved by the Architect/Engineer.
2. Use Mix No. 1 for clearances of 1" or less, and Mix No. 2 for all larger clearances.
3. Grout under equipment bases, around pipes, at pipe sleeves, etc., and where shown on the drawings.

2.5 OPENINGS IN FLOORS, WALLS AND CEILINGS

A. Exact locations of all openings for the installation of materials shall be determined by the Contractor and given to the General Contractor for installation or construction as the structure is built.

B. Coordinate all openings with other Contractors.

C. Hire the proper tradesman and furnish all labor, material and equipment to cut openings in or through existing structures, or openings in new structures that were not installed, or additional openings. Repair all spalling and damage to the satisfaction of the Architect/Engineer. Make saw cuts before breaking out concrete to ensure even and uniform opening edges.

D. Said cutting shall be at the complete expense of each Contractor. Failure to coordinate openings with other Contractors shall not exempt the Contractor from providing openings at Contractor's expense.

E. Do not cut structural members without written approval of the Architect or Structural Engineer.

F. Exposed Housing Penetrations: Seal pipes with surface temperature below 150°F, penetrating housings with conical stepped, white silicone, EPDM or neoprene pipe flashings and stainless steel clamps equal to Portals Plus Pipe Boots or Pipetite.

2.6 ROOF PENETRATIONS

A. Roof Curb Enclosure: Provide weatherproof roof curb and enclosure for pipe penetrations. Refer to drawings for details.

B. Conical Pipe Boot: Seal pipes with surface temperature below 150°F penetrating single-ply roofs with conical stepped, UV-resistant silicone, EPDM or neoprene pipe flashings and stainless steel clamps equal to Portals Plus Pipe Boots or Pipetite. Color: shall match roofing membrane.

C. Break insulation only at the clamp for pipes between 60°F and 150°F. Seal outdoor insulation edges watertight.

		Element	
Model	Service	Material	Temperature Range

S	Standard (Stainless)	EPDM	-40°F to 250°F
T	High/Low Temperature (Steam)	Silicone	-67°F to 400°F
T	Fire Seals (1 hour)	Silicone	-67°F to 400°F
FS	Fire Seals (3 hours)	Silicone	-67°F to 400°F
OS	Oil Resistant/Stainless	Nitrile	-40°F to 210°F

2.7 ESCUTCHEON PLATES AND TRIM

A. Fit escutcheons to all insulated or uninsulated exposed pipes passing through walls, floors, or ceilings of finished rooms.

B. Escutcheons shall be heavy gauge, cold rolled steel, copper coated under a chromium plated finish, heavy spring clip, rigid hinge and latch.

C. Install galvanized steel (unless otherwise indicated) trim strip to cover vacant space and raw construction edges of all rectangular openings in finished rooms. This includes pipe openings.

2.8 PIPE PENETRATIONS

A. Seal all pipe penetrations. Seal non-rated walls and floor penetrations with grout or caulk. Backing material may be used.

B. Seal fire rated wall and floor penetrations with fire seal system as specified.

2.9 PIPE ANCHORS

A. Provide all items needed to allow adequate expansion and contraction of all piping. All piping shall be supported, guided, aligned, and anchored as required.

B. Repair all piping leaks and associated damage. Pipes shall not rub on any part of the building.

2.10 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

PART 3 - EXECUTION

3.1 PLUMBING SUPPORTS AND ANCHORS

A. General Installation Requirements:

1. Install all items per manufacturer's instructions.
2. Coordinate the location and method of support of piping systems with all installations under other Divisions and Sections of the Specifications.

3. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
4. Supports shall extend directly to building structure. Do not support piping from duct hangers unless coordinated with sheet metal contractor prior to installation. Do not allow lighting or ceiling supports to be hung from piping supports.

B. Supports Requirements:

1. Where building structural steel is fireproofed, all hangers, clamps, auxiliary steel, etc., which attach to it shall be installed prior to application of fireproofing. Repair all fireproofing damaged during pipe installation.
2. Set all concrete inserts in place before pouring concrete.
3. Furnish, install and prime all auxiliary structural steel for support of piping systems that are not shown on the Drawings as being by others.
4. Install hangers and supports complete with lock nuts, clamps, rods, bolts, couplings, swivels, inserts and required accessories.
5. Hangers for horizontal piping shall have adequate means of vertical adjustment for alignment.

C. Pipe Requirements:

1. Support all piping and equipment, including valves, strainers, traps and other specialties and accessories to avoid objectionable or excessive stress, deflection, swaying, sagging or vibration in the piping or building structure during erection, cleaning, testing and normal operation of the systems.
2. Do not, however, restrain piping to cause it to snake or buckle between supports or to prevent proper movement due to expansion and contraction.
3. Support piping at equipment and valves so they can be disconnected and removed without further supporting the piping.
4. Piping shall not introduce strains or distortion to connected equipment.
5. Parallel horizontal pipes may be supported on trapeze hangers made of structural shapes and hanger rods; otherwise, pipes shall be supported with individual hangers.
6. Trapeze hangers may be used where ducts interfere with normal pipe hanging.
7. Provide additional supports where pipe changes direction, adjacent to flanged valves and strainers, at equipment connections and heavy fittings.
8. Provide at least one hanger adjacent to each joint in grooved end steel pipe with mechanical couplings.

D. Provided the installation complies with all loading requirements of truss and joist manufacturers, the following practices are acceptable:

1. Loads of 100 lbs. or less may be attached anywhere along the top or bottom chords of trusses or joists with a minimum 3' spacing between loads.
2. Loads greater than 100 lbs. must be hung concentrically and may be hung from top or bottom chord, provided one of the following conditions is met:

    a. The hanger is attached within 6" from a web/chord joint.
    b. Additional L2x2x1/4 web reinforcement is installed per manufacturer's requirements.

3. It is prohibited to cantilever a load using an angle or other structural component that is attached to a truss or joist in such a fashion that a torsional force is applied to that structural member.
4. If conditions cannot be met, coordinate installation with truss or joist manufacturer and contact Architect/Engineer.

E. After piping and insulation installation are complete, cut hanger rods back at trapeze supports so they do not extend more than 3/4" below bottom face of lowest fastener and blunt any sharp edges.

F. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (limitation not required with concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and architectural items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.

G. Do not exceed the manufacturer's recommended maximum load for any hanger or support.

H. Steel/Concrete Structure: Spacing of hangers shall not exceed the compressive strength of the insulation inserts, and in no case shall exceed the following:

1. Steel and Fiberglass (Std. Weight or Heavier - Liquid Service):

a. Maximum Spacing:

1) 1-1/4" & under: 7'-0"
2) 1-1/2": 9'-0"
3) 2": 10'-0"
4) 2-1/2": 11'-0"
5) 3": 12'-0"
6) 4" & larger: 12'-0"

2. Hard Drawn Copper & Brass (Liquid Service):

a. Maximum Spacing:

1) 3/4" and under: 5'-0"
2) 1": 6'-0"
3) 1-1/4": 7'-0"
4) 1-1/2" 8'-0"
5) 2": 8'-0"
6) 2-1/2": 9'-0"
7) 3": 10'-0"
8) 4": 12'-0"
9) 6": 12'-0"

3. Plastic Pipe:

    a. Hangers shall be spaced based on the piping system manufacturer's instructions or, if no system instructions are available, space hangers at 4'-0" maximum centers.

4. Ultra-Flexible Pipe, and Flexible Hose, and Soft Copper Tubing:

    a. Continuous channel with hangers maximum 8'-0" OC.

I. Wood Structure: Spacing of hangers shall not exceed the compressive strength of the insulation inserts, and in no case shall exceed the following:

1. Steel and Fiberglass (Std. Weight or Heavier - Liquid Service):

    a. Maximum Spacing:

        1) 1-1/4" & under: 7'-0"
        2) 1-1/2": 9'-0"
        3) 2": 10'-0"
        4) 2-1/2": 11'-0"
        5) 3": 12'-0"
        6) 4" through 6": 12'-0"
        7) 8": 9'-0"
        8) 10": 6'-0"
        9) 12": 4'-0"

2. Hard Drawn Copper & Brass (Liquid Service):

    a. Maximum Spacing:

        1) 3/4" and under: 5'-0"
        2) 1": 6'-0"
        3) 1-1/4": 7'-0"
        4) 1-1/2" 8'-0"
        5) 2": 8'-0"
        6) 2-1/2": 9'-0"
        7) 3": 10'-0"
        8) 4": 12'-0"
        9) 6": 12'-0"

3. Plastic Pipe:

    a. Hangers shall be spaced based on the piping system manufacturer's instructions or, if no system instructions are available, space hangers at 4'-0" maximum centers.

4. Ultra-Flexible Pipe, Flexible Hose, and Soft Copper Tubing:

    a. Continuous channel with hangers maximum 8'-0" OC.

J. Installation of hangers shall conform to MSS SP-58, 69, 89 and the applicable Plumbing Code.

END OF SECTION 22 05 29

SECTION 22 05 50 - SEISMIC REQUIREMENTS FOR EQUIPMENT AND SUPPORTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Seismic Requirements.

1.2 QUALITY ASSURANCE

A. General:

1. The contractor shall retain a specialty consultant or equipment manufacturer to develop a seismic restraint and support system and perform seismic calculations in accordance with these specifications, state, and local codes.
2. Items used for seismic restraint of equipment and systems shall be specifically manufactured for seismic restraint.
3. These requirements are beyond those listed in Section 22 05 29 of these specifications. Where a conflict arises between the seismic requirements of this section and any other section, the Architect/Engineer shall be immediately notified for direction to proceed.

B. Manufacturer:

1. System Supports/Restraints: Company specializing in the manufacture of products specified in this Section.
2. Equipment: Each company providing equipment that must meet seismic requirements shall provide certification included in project submittals the equipment supplied for the project meets or exceeds the seismic requirements of the project.

C. Testing Agency: An independent testing agency, acceptable to Authorities Having Jurisdiction, with experience and capability to conduct the testing indicated.

D. Installer: Company specializing in performing the work of this Section.

1.3 SUBMITTALS

A. Submit under provisions of Section 22 05 00.

B. Shop Drawings:

1. Calculations, restraint selections, and installation details shall be designed and sealed by a Professional Engineer licensed in the state where the project is located experienced in seismic restraint design and installation.
2. Coordination Drawings: Plans and sections drawn to scale, coordinating seismic bracing of mechanical components with other systems and equipment in the vicinity, including other seismic restraints.

3. Manufacturer's Certifications: Professional Structural Engineer licensed in the state where the project is located shall review and approve manufacturer's certifications of compliance.
4. System Supports/Restraints - Submit for each condition requiring seismic bracing:

    a. Calculations for each seismic brace and detail utilized on the project.
    b. Plan drawings showing locations and types of seismic braces on contractor fabrication/installation drawings.
    c. Cross-reference between details and plan drawings to indicate exactly which brace is being installed at each location. Details provided are to clearly indicate attachments to structure, correctly representing the fastening requirements of bracing.
    d. Clear indication of brace design forces and maximum potential component forces at attachment points to building structure for confirmation of acceptability by the Structural Engineer of Record.

5. Equipment - Submit for each piece of equipment supplied:

    a. Certification that the equipment supplied for the project meets or exceeds the seismic requirements specified.
    b. Specific details of seismic design features of equipment and maximum seismic loads imparted to the structural support.
    c. Engineering calculations and details for equipment anchorage and support structure.

C. A seismic restraint designer shall be provided whether or not exceptions listed in the applicable building code are met. If seismic restraints are not provided for a system that requires seismic bracing, the seismic designer shall submit a signed and sealed letter to the Architect/Engineer and Authorities Having Jurisdiction stating the exceptions, along with code reference, utilized for each item. Seismic designer shall review system installation for general conformance to the exception requirements stated in the code and document, in writing, the system has been installed in accordance to the exception.

1.4 TESTING AND INSPECTION

A. Special Inspection and Testing shall be done in accordance with Chapter 17 of the International Building Code.

B. The Owner shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704 and 1705.

C. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected. The fabricator shall submit a certificate of compliance that the work has been performed in accordance with the approved plans and specifications to the building official and the Architect and Engineer of Record.

D. The Special Inspection Agency shall furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The reports shall be completed and furnished within 48 hours of inspected work. A final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency's knowledge, in conformance with the approved plans and specifications shall be submitted.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site. Accept material on site in factory containers and packing. Inspect for damage. Protect from damage and contamination by maintaining factory packaging until installation. Follow manufacturer's instructions for storage.

1.6 DESIGN REQUIREMENTS

A. This project is subject to the seismic bracing requirements of the International Building Code, 2012 edition.

B. This project is subject to the seismic bracing requirements of California Building Code, .

C. The following criteria are applicable to this project:

1. Risk Category: IV
2. Seismic Importance Factor: IE = 1.5Seismic Design Category: D
3. Component Amplification Factors (ap) and Component Response Modification Factors (Rp) shall be taken from Table 13.5-1 in ASCE 7-16 for the individual equipment or system being restrained.
4. Component Importance Factors (Ip) shall be taken from Section 13.1.3 in ASCE 7-16 for the individual equipment or system being restrained.
5. The total height of the structure and the height of the system to be restrained within the structure shall be determined in coordination with architectural plans and the General Contractor.

D. Forces shall be calculated with the above requirements and Equations 13.3-1, -2, and -3 of ASCE 7-16, unless exempted by 13.1.4.

E. Equipment shall meet International Building Code and ASCE 7 seismic qualification requirements in concurrence with ICC ES AC156 Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems.

F. All seismic anchorage and bracing shall comply with the St. Louis County Rules & Regulations on Anchorage & Sway Bracing - Mechanical, Electrical & Plumbing (MEP) System Components.

G. All seismic anchorage and bracing shall comply with FM Global Property Loss Prevention Data Sheet 1-11, Fire Following Earthquakes.

1.7 COORDINATION

A. Coordinate layout and installation of seismic bracing with building structural systems and architectural features, and with mechanical, fire-protection, electrical and other building features in the vicinity.

B. Coordinate concrete bases with building structural system.

1.8 WARRANTY

A. Provide one-year warranty on parts and labor for manufacturer defects and installation workmanship.

PART 2 - PRODUCTS

2.1 SUPPLIERS

A. Following is a partial list of manufacturer/supplier contact information for seismic restraints:

1. B-Line Systems, Inc. (800) 851-7415, www.b-line.com.
2. Unistrut Corporation http://www.unistrut.us/
3. Kinetics Noise Control (877) 457-2695, www.kineticsnoise.com.
4. Mason Industries, Inc. www.mason-ind.com.
5. Loos & Co., Inc. (800) 321-5667, www.loosnaples.com.
6. Tolco (909) 737-5599, www.tolco.com
7. ISAT 877.523.6060, www.isatsb.com
8. Vibro-Acoustics (416) 291-7371, https://virs.vibro-acoustics.com/

2.2 SEISMIC DESIGN CRITERIA

A. This section describes the requirements for seismic restraint of systems and equipment related to continued operation of the facility after a design seismic event.

B. Definitions:

1. Stay in Place:

a. All systems and equipment shall be anchored and restrained such that the anchoring system is intended not to fail and equipment and/or system components will not fall.

2.3 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

A. General:

1. Seismic restraint designer shall coordinate all attachments with the Structural Engineer of Record; refer to submittal requirements.

2. The seismic restraint design shall be based on actual equipment data obtained from manufacturer's submittals or the manufacturer. The equipment manufacturer shall verify and provide written certification the attachment points on the equipment can accept the combination of seismic, weight, and other imposed loads.
3. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
4. Analysis shall detail anchoring methods, bolt diameter, embedment, and weld length.
5. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code.
6. All seismic restraints and combination isolator/restraints shall have verification of their seismic capabilities witnessed by an independent testing agency.

B. Friction from gravity loads shall not be considered resistance to seismic forces.

C. Fire protection systems shall meet the requirements of NFPA-13 and NFPA-14 for the building seismic requirements.

D. Housekeeping Pads:

1. Reinforced housekeeping pads shall be provided to handle shear, tension, and compression forces with proper reinforcement, doweling, and attachments connecting the pad to the structural slab.

2.4 SEISMIC RESTRAINT AND CONSTRUCTION OF EQUIPMENT

A. Equipment supplied for the project shall be designed to meet the requirements of lateral forces calculated using the applicable code and method described above.

B. The following is a partial list of equipment that shall be restrained and that shall be constructed to meet seismic forces described in this section:

1. Air Compressors
2. Pumps
3. Tanks

2.5 MATERIALS

A. Use the following materials for restraints:

1. Indoor Dry Locations: Steel, zinc plated.
2. Outdoors and Damp Locations: Galvanized steel.
3. Corrosive Locations: Stainless steel.

2.6 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

A. Strength: Defined in reports by ICC Evaluation Service or another agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.

B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type. Comply with IBC, ACI and ICC ES requirements for cracked concrete anchors.

C. Concrete Inserts: Steel-channel type.

D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM F3125, Grade A 325.

E. Welding Lugs: Comply with MSS SP-69, Type 57.

F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.

G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings and matched to the type and size of anchor bolts and studs used.

H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings and matched to the type and size of attachment devices used.

2.7 SEISMIC BRACING COMPONENTS

A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch-thick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.

1. Materials for Channel: ASTM A 1011, GR 33.
2. Materials for Fittings and Accessories: ASTM A 635, ASTM A 576, or ASTM A 36.
3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.
4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.

B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.

C. Cable-Type Bracing Assemblies: Zinc-coated, high-strength steel wire rope cable attached to steel thimbles, brackets, and bolts designed for cable service.

1. Arrange units for attachment to the braced component at one end and to the structure at the other end.
2. Wire Rope Cable: Comply with ASTM A 603. Use 49- or 133-strand cable with a minimum strength of 2 times the calculated maximum seismic force to be resisted.

D. Hanger Rod Stiffeners: Slotted steel channels with internally bolted connections to hanger rod.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to the applicable code sections and Authority Having Jurisdiction for the exact seismic restraint requirements of piping, ductwork, conduit, equipment, etc.

B. Layout of transverse and longitudinal bracing shall follow recommendations of approved design standards listed in Part 1 of this specification section.

C. All rigid floor mounted equipment shall have a resilient media between the equipment mounting hole and the anchor bolt in concrete.

D. All seismic restraint systems shall be installed in strict accordance with the manufacturer's written instructions and all certified submittal data.

E. Installation of seismic restraints shall not cause any change in position of equipment, piping, or ductwork, resulting in stresses or misalignment.

F. No rigid connections between equipment and the building structure shall be made that degrade the noise and vibration-isolation system specified.

G. Do not install any equipment, piping, duct, or conduit that makes rigid connections with the building unless isolation is not specified.

H. Coordinate work with all other trades to avoid rigid contact with the building. Any conflicts with other trades that will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions shall be brought to the Architect/Engineer's attention prior to specific equipment selection.

I. Prior to installation, bring to the Architect/Engineer's attention any discrepancies between the specifications and the field conditions, or changes required due to specific equipment selection.

J. Bracing may occur from flanges of structural beams, upper truss cords of bar joists, cast in place inserts, or International Code Council approved seismic anchors for installation in concrete.

K. Cable restraints shall be installed slightly slack to avoid short-circuiting the isolated suspended equipment, ductwork, piping, or conduit.

L. Cable assemblies shall be installed taut on non-isolated systems. Solid braces may be used in place of cables on rigidly attached systems only.

M. Do not install cables over sharp corners.

N. Brace support rods when necessary to accept compressive loads. Welding of compression braces to the vertical support rods is not acceptable.

O. Provide reinforced clevis bolts when required.

P. The vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not acceptable.

Q. Post-Installed anchors shall be provided to meet seismic requirements.

R. Vertical pipe risers flexibly supported to accommodate thermal motion and/or pipe vibration shall be guided to maintain pipe stability and provide horizontal seismic restraint.

S. Seismic restraints shall be mechanically attached to the system. Looping restraints around the system is not acceptable.

T. Piping crossing building seismic or expansion joints, passing from building to building, or supported from different portions of the building shall be installed to allow differential support displacements without damaging the pipe, equipment connections, or support connections. Pipe offsets, loops, anchors, and guides shall be installed as required to provide required motion capability and limit motion of adjacent piping.

U. Water tanks shall be secured to their saddles by welding or proper concrete attachment, and those saddles shall be properly attached to the structure.

V. Brace all terminal units with water coils as required by the building code and provide flexible connection to the coil if bracing is required.

W. Independently brace duct mounted equipment (terminal units, in-line fans, etc.) and the associated suspended ductwork.

X. Do not brace a system to two different structures such as a wall and a ceiling.

Y. Provide appropriately sized openings in walls, floors, and ceilings for anticipated seismic movement. Provide fire seal systems in fire-rated walls.

Z. Positively attach all roof mounted equipment to roof curbs. Positively attach all roof curbs to building structure.

AA. Exposed seismic supports in occupied areas shall be guarded or covered to protect occupants.

BB. Coordinate seismic bracing of architecturally exposed ductwork with the Architect/Engineer.

3.2 SEISMIC RESTRAINT EXCLUSIONS

A. Refer to the applicable code sections and Authority Having Jurisdiction for allowable exclusions.

END OF SECTION 22 05 50

SECTION 22 05 53 - PLUMBING IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Identification of products installed under Division 22.

1.2 SUBMITTALS

A. Submit shop drawings under provisions of Section 22 05 00. Include list of items identified, wording, letter sizes, and color coding.

B. Include valve chart and schedule listing valve tag number, location, function, and valve manufacturer's name and model number.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. 3M
2. Bunting
3. Calpico
4. Craftmark
5. Emedco
6. Kolbi Industries
7. Seton
8. W.H. Brady
9. Marking Services

2.2 MATERIALS

A. All pipe markers (purchased or stenciled) shall conform to ANSI A13.1. Marker lengths and letter sizes shall be at least the following:

OD of Pipe or Insulation	Marker Length	Size of Letters
Up to and including 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"
8" to 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

Plastic tags may be used for outside diameters under 3/4"

B. Aluminum Nameplates: Black enamel background with natural aluminum border and engraved letters furnished with two mounting holes and screws.

C. Brass Tags: Brass background with engraved black letters. Tag size minimum 1-1/2" square or 1-1/2" round.

D. Vinyl Pipe Markers: Colored vinyl with permanent pressure sensitive adhesive backing.

E. Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape 6" wide by 3.5 mils thick, manufactured for direct burial, with aluminum foil core for location by non-ferric metal detectors and bold lettering identifying buried item.

F. Tracer Wire:

1. Single copper conductors shall be solid or stranded annealed or hard uncoated copper per UL83 and ASTM requirements. Tracer tape or copper-coated steel wire is not acceptable.
2. Conductor shall be insulated with HMWPE as specified and applied in a concentric manner. The minimum at any point shall not be less than 90% of the specified average thickness in compliance with UL 83.
3. Tracer wire shall be continuously spark tested at 7500 Volts DC. Other electrical and mechanical tests shall be in accordance with UL 1581.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all products per manufacturer's recommendations.

B. Degrease and clean surfaces to receive adhesive for identification materials.

C. Valves:

1. All valves (except shutoff valves at equipment) shall have numbered tags.
2. Provide or replace numbered tags on all existing valves that are connected to new systems or that have been revised.
3. Provide all existing valves used to extend utilities to this project with numbered tags. Review tag numbering sequence with the Owner prior to ordering tags.
4. Secure tags with heavy duty key chain and brass "S" link or with mechanically fastened plastic straps.
5. Attach to handwheel or around valve stem. On lever operated valves, drill the lever to attach tags.
6. Number all tags and show the service of the pipe.
7. Provide one Plexiglas framed valve directory listing all valves, with respective tag numbers, uses and locations. Mount directory in location chosen by the Architect/Engineer.
8. Provide one 36" x 24" minimum Plexiglas framed piping schematic showing valve locations with respective tag numbers. Mount directory in location chosen by the Architect/Engineer.

9. Provide two sets of laminated 8-1/2" x 11" (letter size) copies of a valve directory listing all valves, with respective tag numbers, uses, and locations. The directory shall be reviewed by the Owner and Architect/Engineer prior to laminating final copies. Laminated copies shall have brass eyelet in at least one corner for easy hanging.

D. Pipe Markers:

1. Adhesive Backed Markers: Use Brady Style 1, 2, or 3 on pipes 3" diameter and larger. Use Brady Style 4, 6, or 8 on pipes under 3" diameter. Similar styles by other listed manufacturers are acceptable. Secure all markers at both ends with a wrap of pressure sensitive tape completely around the pipe.
2. Snap-on Markers: Use Seton "Setmark" on pipes up to 5-7/8" OD. Use Seton "Setmark" with nylon or Velcro ties for pipes 6" OD and over. Similar styles by other listed manufacturers are acceptable.

3. Apply markers and arrows in the following locations where clearly visible:

   a. At each valve.
   b. On both sides of walls that pipes penetrate.
   c. At least every 20 feet along all pipes.
   d. On each riser and each leg of each "T" joint.
   e. At least once in every room and each story traversed.

4. Underground Pipe Markers: Install 8" to 10" below grade, directly above buried pipes.

E. Equipment:

1. All equipment not easily identifiable such as controls, relays, gauges, etc.; and all equipment in an area remote from its function shall have nameplates or plastic tags listing name, function, and drawing symbol. Do not label exposed equipment in public areas.
2. Mechanical equipment that is not covered by the U.S. National Appliance Energy Conservation Act (NAECA) of 1987 shall carry a permanent label installed by the manufacturer stating that the equipment complies with the requirements of ASHRAE 90.1.

F. Tracer Wire:

1. Tracer wire shall be installed on top of all non-metallic buried utilities.
2. Tracer wire shall be taped directly to plastic water or drain pipe.
3. Tracer wire shall not be fastened directly or indirectly to gas piping.
4. Tracer wire when attached shall be secured to the pipe a minimum of every 10 feet and at all changes of direction.
5. Tape shall be Polyken "930-35", Protecto-Wrap "310", or approved equal.
6. Tracer wire shall be continuous between boxes and shall be tested for continuity.
7. Splices in tracer wire shall be made with a water proof splice kit to prevent corrosion. Wire nuts shall not be used.

8. The tracer wire shall daylight to grade through a 2" PVC conduit, at the point of the utility entrance to building. PVC conduit shall be capped and labeled as future contact point to locate the utility.

3.2 SCHEDULE

A. Pipes to be marked shall be labeled with text as follows, regardless of which method or material is used:

1. CONDENSATE DRAIN: White lettering; green background
2. DOMESTIC COLD WATER: White lettering; green background
3. DOMESTIC HOT WATER - 140°F: White lettering; green background
4. DOMESTIC HOT WATER CIRCULATING - 140°F: White lettering; green background
5. SANITARY SEWER: Black lettering; yellow background
6. VENT: Black lettering; yellow background
7. NATURAL GAS: Black lettering; yellow background
8. All Underground Pipes: Varies
9. Tracer Wire - Natural Gas Pipe Lines: Black lettering; yellow background
10. Tracer Wire - All other buried types: White lettering; green background

END OF SECTION 22 05 53

SECTION 22 05 93 - PLUMBING TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Testing, adjusting, and balancing of plumbing systems.

1.2 QUALITY ASSURANCE

A. Agency shall be a company specializing in the adjusting and balancing of systems specified in this section with minimum three years' experience. Perform work under supervision of AABC Certified Test and Balance Engineer, NEBB Certified Testing, Balancing and Adjusting Supervisor, SMARTA Certified Air and Hydronic Balancer, or TABB Certified Supervisor.

B. Work shall be performed in accordance with the requirements of the references listed at the start of this section.

1.3 SUBMITTALS

A. Submit copies of report forms, balancing procedures, and the name and qualifications of testing and balancing agency for approval within 30 days after award of Contract.

B. Electronic Copies:

1. Submit a certified copy of test reports to the Architect/Engineer for approval. Electronic copies shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Copies that are not legible will be returned to the Contractor for resubmittal. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
2. Electronic file size shall be limited to a maximum of 10MB. Larger files shall be divided into files that are clearly labeled as "1 of 2", "2 of 2", etc.
3. All text shall be searchable.
4. Bookmarks shall be used. All bookmark titles shall be an active link to the index page and index tabs.

C. Paper Copies:

1. Submit four (4) certified copies of test reports to the Architect/Engineer for approval in soft cover, 3-hole binder manuals, with cover identification. Include index page and indexing tabs.

1.4 REPORT FORMS

A. Submit reports on AABC, SMACNA or NEBB forms. Use custom forms approved by the Architect/Engineer when needed to supply specified information.

B. Include in the final report a schematic drawing showing each system component, including balancing devices, for each system. Each drawing shall be included with the test reports required for that system. The schematic drawings shall identify all testing points and cross-reference these points to the report forms and procedures.

C. Refer to PART 4 for required reports.

1.5 WARRANTY/GUARANTEE

A. The TAB Contractor shall include an extended warranty of 90 days after owner receipt of a completed balancing report, during which time the Owner may request a recheck of terminals, or resetting of any outlet, coil, or device listed in the test report. This warranty shall provide a minimum of 24 manhours of onsite service time. If it is determined that the new test results are not within the design criteria, the balancer shall rebalance the system according to design criteria.

B. Warranty/Guarantee must meet one of the following programs: TABB International Quality Assurance Program, AABC National Project Performance Guarantee, NEBB's Conformance Certification.

1.6 SCHEDULING

A. Coordinate schedule with other trades. Provide a minimum of seven days' notice to all trades and the Architect/Engineer prior to performing each test.

B. Project will be constructed in phases. Provide balancing report after each phase is complete.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. All procedures must conform to a published standard listed in the References article of this section. All equipment shall be adjusted in accordance with the manufacturer's recommendations. Any system not listed in this specification but installed under the contract documents shall be balanced using a procedure from a published standard listed in the References article.

B. The Balancing Contractor shall incorporate all pertinent documented construction changes (e.g., submittals/shop drawings, change orders, RFIs, ASIs, etc.) and include in the balancing report.

C. Recorded data shall represent actual measured or observed conditions.

D. Cut insulation, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing is complete, close probe holes and patch insulation with new materials as specified. Restore vapor barrier and finish as specified.

E. Permanently mark setting of valves and other adjustment devices allowing for settings to be restored. Set and lock memory stops.

F. Leave systems in proper working order, closing access doors, closing doors to electrical switch boxes, plugging test holes, and restoring thermostats to specified settings.

G. Installations with systems consisting of multiple components shall be balanced with all system components operating.

3.2 EXAMINATION

A. Before beginning work, verify that systems are complete and operable. Ensure the following:

1. General Equipment Requirements:

a. Equipment is safe to operate and in normal condition.
b. Equipment with moving parts is properly lubricated.
c. Temperature control systems are complete and operable.
d. Proper thermal overload protection is in place for electrical equipment.
e. Direction of rotation of all pumps is correct.
f. Access doors are closed and end caps are in place.

2. Pipe System Requirements:

a. Hydronic systems have been cleaned, filled, and vented.
b. Strainer screens are clean and in place.
c. Shutoff, throttling and balancing valves are open.

B. Report any defects or deficiencies to Architect/Engineer.

C. Promptly report items that are abnormal or prevent proper balancing.

D. If, for design reasons, system cannot be properly balanced, report as soon as observed.

E. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to the Architect/Engineer for spot checks during testing.

B. Instruments shall be calibrated within six months of testing performed for project, or more recently if recommended by the instrument manufacturer.

3.4 INSTALLATION TOLERANCES

A. ± 10% of scheduled values:

1. Adjust piping systems to ±10% of design values.

3.5 ADJUSTING

A. After adjustment, take measurements to verify balance has not been disrupted or that disruption has been rectified.

B. Once balancing of systems is complete, at least one valve must be 100% open.

C. After testing, adjusting and balancing are complete, operate each system and randomly check measurements to verify system is operating as reported in the report. Document any discrepancies.

D. Contractor responsible for each motor shall also be responsible for replacement sheaves. Coordinate with contractor.

E. Contractor responsible for pump shall trim impeller to final duty point as instructed by this contractor on all pumps not driven by a VFD. Coordinate with contractor.

3.6 SUBMISSION OF REPORTS

A. Fill in test results on appropriate forms.

B. Complete all applicable tests, certifications, forms, and matrices listed in the Illinois Department of Public Health (IDPH) Final Occupancy Checklist Certifications for Request of Inspection.

PART 4 - SYSTEMS TO BE TESTED, ADJUSTED AND BALANCED

4.1 GENERAL REQUIREMENTS

A. Title Page:

1. Project name.
2. Project location.
3. Project Architect.
4. Project Engineer (IMEG Corp.).
5. Project General Contractor.
6. TAB Company name, address, phone number.
7. TAB Supervisor's name and certification number.
8. TAB Supervisor's signature and date.
9. Report date.

B. Report Index

C. General Information:

1. Test conditions.
2. Nomenclature used throughout report.
3. Notable system characteristics/discrepancies from design.
4. Test standards followed.
5. Any deficiencies noted.
6. Quality assurance statement.

D. Instrument List:

1. Instrument.
2. Manufacturer, model, and serial number.
3. Range.
4. Calibration date.

4.2 PLUMBING SYSTEMS

A. Pump Data:

1. Drawing symbol.
2. Service.
3. Manufacturer, size, and model.
4. Impeller size: specified, actual, and final (if trimmed).
5. Flow Rate (gpm): specified and actual.
6. Pump Head: specified, operating and shutoff.
7. Suction Pressure: operating and shutoff.
8. Discharge Pressure: operating and shutoff.

B. Electric Motors:

1. Drawing symbol of equipment served.
2. Manufacturer, model, frame.
3. Nameplate: HP, phase, service factor, RPM, operating amps, efficiency.
4. Measured: Amps for each phase.

C. Balancing Valve:

1. Drawing symbol.
2. Service.
3. Location.
4. Size.
5. Manufacturer and model.
6. Flow rate (gpm): specified and actual.
7. Pressure drop: specified and actual.

END OF SECTION 22 05 93

SECTION 22 07 19 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping Insulation.

B. Insulation Jackets.

1.2 QUALITY ASSURANCE

A. Applicator: Company specializing in piping insulation application with five years minimum experience.

B. Materials: Listed and labeled for flame spread/smoke developed rating of no more than 25/50 when tested per ASTM E84 or UL 723 as required by code. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.

C. Products shall not contain asbestos, lead, mercury, or mercury compounds.

D. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

1.3 SUBMITTALS

A. Submit shop drawings per Section 22 05 00. Include product description, list of materials and thickness for each service, and locations.

PART 2 - PRODUCTS

2.1 INSULATION

A. Type A: Glass fiber; ANSI/ASTM C547; 0.24 maximum 'K' value at 75°F; non-combustible. All-purpose polymer or polypropylene service jacket, listed and labeled at no more than 25/50 when tested per ASTM E84 or UL 723 as required by code.

B. Type B: Flexible elastomeric foam insulation; closed-cell, sponge or expanded rubber (polyethylene type is not permitted); ANSI/ASTM C534 Grade 1 Type I for tubular materials; flexible plastic; 0.25 maximum 'K' value at 75°F, listed and labeled at no more than 25/50 when tested per ASTM E84 or UL 723 as required by code. Maximum 1" thick per layer where multiple layers are specified.

C. Type E: Preformed rigid cellular polyisocyanurate insulation; ANSI/ASTM C591; maximum 'K' value of 0.19 at 75°F; density 4.0lb/ft; minimum compressive strength 95 psi parallel to rise; moisture resistant; listed and labeled at no more than 25/50 when tested per ASTM E84 or UL 723 as required by code; suitable for -297°F to +300°F.

2.2 VAPOR BARRIER JACKETS

A. All-purpose polymer or polypropylene service jacket vapor barrier with self-sealing adhesive joints. Beach puncture resistance ratio of at least 50 units. Tensile strength: 35 psi minimum. Single, self-seal acrylic adhesive on longitudinal jacket laps and butt strips.

B. Polyvinylidene Chloride (PVDC or Saran) film and tape: Durable and highly moisture and moisture vapor resistant. Please refer to manufacturer's recommended installation guidelines.

2.3 JACKET COVERINGS

A. Plastic Jackets and Fitting Covers: High impact, glossy white, 0.020" thick, self-extinguishing plastic. Suitable for use indoors or outdoors with ultraviolet inhibitors. Suitable for -40°°F to 150°°F. Listed and labeled at no more than 25/50 when tested per ASTM E84 or UL 723 as required by code.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install insulation after piping has been tested. Pipe shall be clean, dry and free of rust before applying insulation.

3.2 INSTALLATION

A. General Installation Requirements:

1. Install materials per manufacturer's instructions, building codes and industry standards.
2. Continue insulation with vapor barrier through penetrations. This applies to all insulated piping. Maintain fire rating of all penetrations.

B. Insulated Piping Operating Below 60°F:

1. Insulate fittings, valves, unions, flanges, strainers, flexible connections, flexible hoses, and expansion joints. Seal all penetrations of vapor barrier.
2. On piping operating below 60°F in locations that are not mechanically cooled (e.g., penthouses, mechanical rooms, tunnels, chases at exterior walls, etc.), Type B insulation shall be used.
3. All balance valves with fluid operating below 60°F shall be insulated with a removable plug wrapped with vapor barrier tape to allow reading and adjusting of the valve.

C. Insulated Piping Operating Between 60°F and 140°F:

1. Do not insulate flanges and unions, but bevel and seal ends of insulation at such locations. Insulate all fittings, valves and strainers.

D. Insulated Piping Operating Above 140°F:

1. Insulate fittings, valves, flanges, and strainers.
2. All balance valves with fluid operating above 140°F shall be insulated and an opening shall be left in the insulation to allow for reading and adjusting the valve.

E. Exposed Piping:

1. Locate and cover seams in least visible locations.
2. Where exposed insulated piping extends above the floor, provide a sheet metal guard around the insulation extending 12" above the floor. Guard shall be 0.016" cylindrical smooth or stucco aluminum and shall fit tightly to the insulation.
3. On exposed piping serving kitchen equipment or plumbing fixtures, the piping shall be insulated unless local code allows it to be uninsulated. In no instance should the uninsulated portion of the piping be more than 4ft in developed length.

3.3 SUPPORT PROTECTION

A. Provide a shield on all insulated piping at each support between the insulation jacket and the support.

B. On all insulated piping greater than 1-1/2", provide shield with insulation insert of same thickness and contour as adjoining insulation at each support, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. Inserts shall be as follows:

1. The insert shall be suitable for planned temperatures, be suitable for use with specific pipe material, and shall be a minimum 180° cylindrical segment the same length as metal shields. Inserts shall be:

a. Molded hydrous calcium silicate (only use for pipes with operating temperatures above 90°F, with a minimum compressive strength of 100 psi is acceptable for pipe sizes 14" and below. For pipe sizes larger than 14", provide rolled steel plate in addition to the shield.
b. Polyisocyanurate insulation (for pipes below 300°F with a minimum compressive strength of 24 psi is acceptable for pipe sizes 3" and below, minimum 60 psi for pipe sizes 4" to 10". For pipe sizes larger than 10", provide rolled steel plate in addition to the shield Where insulation is installed on piping located within return air plenums and mechanical rooms, insulation shall be listed and labeled at no more than 25/50 when tested per ASTM E84 or UL 723 as required by code.
c. Phenolic (for pipes operating below 250°F with a minimum compressive strength of 90 psi is acceptable for pipe sizes 14" and below. For pipe sizes larger than 14", provide rolled steel plate in addition to the shield.

d. As an alternative to separate pipe insulation insert and saddle, properly sized manufactured integral rigid insulation insert and shield assemblies may be used.

1) Products:

a) Buckaroo CoolDry
b) Cooper/B-Line Fig. B3380 through B3384
c) Pipe Shields A1000, A2000

e. Insulation Couplings:

1) Molded thermoplastic slip coupling, -65°F to 275°F, sizes up to 4-1/8" OD, and receive insulation thickness up to 1". Suitable for use indoors or outdoors with UV stabilizers. Vertical insulation riser clamps shall have a 1,000lb vertical load rating. On cold pipes operating below 60°F, cover joint and coupling with vapor barrier mastic to ensure continuous vapor barrier.
2) Horizontal Strut Mounted Insulated Pipe Manufacturers:

a) Klo-Shure or equal

3) Vertical:

a) Manufacturers: Klo-Shure Titan or equal

f. Rectangular blocks, plugs, or wood material are not acceptable.
g. Temporary wood blocking may be used by the Piping Contractor for proper height; however, these must be removed and replaced with proper inserts by the Insulation Contractor. Refer to Supports and Anchors specification section for additional information.

C. Neatly finish insulation at supports, protrusions, and interruptions.

D. Install metal shields between all hangers or supports and the pipe insulation. Shields shall be galvanized sheet metal, half-round with flared edges. Adhere shields to insulation. On cold piping, seal the shields vapor-tight to the insulation as required to maintain the vapor barrier, or add separate vapor barrier jacket.

E. Shields shall be at least the following lengths and gauges:

Pipe Size	Shield Size
1/2" to 3-1/2"	12" long x 18 gauge
4"	12" long x 16 gauge
5” to 6"	18" long x 16 gauge
8” to 14"	24" long x 14 gauge
16” to 24"	24" long x 12 gauge

F. Ferrous hot piping 4 inches and larger, provide steel saddle at rollers as described in Section 22 05 29 "Plumbing Supports and Anchors".

G. Minimum 1/4" rolled galvanized steel plates shall be provided in addition to the sleeves as reinforcement on large pipes to reduce point loading on roller, trapeze hanger and strut support locations depending on insulation compressive strength. Refer to section above for exact locations.

3.4 INSULATION

A. Type A Insulation:

1. All Service Jackets: Seal all longitudinal joints with self-seal laps using a single pressure sensitive adhesive system. Do not staple.
2. Insulation without self-seal lap may be used if installed with Benjamin Foster 85-20 or equivalent Chicago Mastic, 3M or Childers lap adhesive.
3. Apply insulation with laps on top of pipe.
4. Fittings, Valve Bodies and Flanges: For 4" and smaller pipes, insulate with 1 lb. density insulation wrapped under compression to a thickness equal to the adjacent pipe insulation. For pipes over 4", use mitered segments of pipe insulation. Finish with preformed plastic fitting covers. Secure fitting covers with pressure sensitive tape at each end. Overlap tape at least 2" on itself. For pipes operating below 60°F seal fitting covers with vapor retarder mastic in addition to tape.

B. Type B Insulation:

1. Install per manufacturer's instructions or ASTM C1710.
2. Elastomeric Cellular Foam: Where possible, slip insulation over the open end of pipe without slitting. Seal all butt ends, longitudinal seams, and fittings with adhesive. At elbows and tees, use mitered connections. Do not compress or crush insulation at cemented joints. Joints shall be sealed completely and not pucker or wrinkle. Paint the outside of outdoor insulation with two coats of latex enamel paint recommended by the manufacturer.
3. Insulation Installation on Straight Pipes and Tubes:

    a. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
    b. Insulation must be installed in compression to allow for expansion and contraction. Insulation shall be pushed onto the pipe, never pulled. Stretching of insulation may result in open seams and joints.

4. Insulation Installation on Valves and Pipe Specialties:

    a. Install preformed sections of same material as straight segments of pipe insulation when available.
    b. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
    c. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

C. Type E Insulation:

1. Indoors, above grade or below grade, Polyvinylidene chloride (PVDC or Saran) vapor retarder film and tape: Seal all longitudinal joints with manufacturer approved adhesive. Secure butt joint strips in a similar manner. Refer to manufacturer's recommendations for installation guidelines.
2. Insulate pipe fittings with prefabricated insulation fittings.

3.5 JACKET COVER INSTALLATION

A. Plastic Covering:

1. Provide vapor barrier as specified for insulation type. Cover with plastic jacket covering. Position seams to shed water.
2. Solvent weld all joints with manufacturer recommended cement.
3. Overlap all laps and butt joints 1-1/2" minimum. Repair any loose ends that do not seal securely. Solvent weld all fitting covers in the same manner. Final installation shall be watertight.
4. All joints in areas noted shall meet USDA standards for Totally Sealed Systems, including overlaps of 1" on circumferential and 1.5" to 2" on longitudinal seams.
5. Use plastic insulation covering on all exposed pipes including, but not limited to:

    a. All exposed piping in areas noted on drawings.
    b. All exposed piping in locker rooms.
    c. All exposed piping below 8'-0" above floor.
    d. All piping in mechanical rooms and/or tunnels that is subject to damage from normal operations. (Example: Piping that must be stepped over routinely.)
    e. All kitchen areas.

6. Elastomeric piping insulation may have two coats of latex paint instead of plastic jacket.
7. Use colored plastic covering on the following pipes:

    a. All exterior piping.

3.6 SCHEDULE

A. Refer to drawings for insulation schedule.

END OF SECTION 22 07 19

SECTION 22 10 00 - PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe and Pipe Fittings.

B. Valves.

C. Check Valves.

1.2 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body. Remanufactured valves are not acceptable.

B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

C. Welders Certification: In accordance with ANSI/ASME Sec 9 or ANSI/AWS D1.1.

D. Piping, Fittings, Valves, and Flux for Potable Water Systems: All components shall be lead free per Federal Act S.3874, Reduction of Lead in Drinking Water Act.

1.3 SUBMITTALS

A. Submit shop drawings per Section 22 05 00.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

1.5 COORDINATION DRAWINGS

A. Reference Coordination Drawings article in Section 22 05 00 for required plumbing systems electronic CAD drawings to be provided to Coordinating Contractor for inclusion into composite coordination drawings.

PART 2 - PRODUCTS

2.1 CAST IRON PIPE

A. Cast Iron; Standard Weight; Hub and Spigot Joints:

B. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets:

1. Pipe: Standard weight no-hub cast iron soil pipe, corrosion protective coating inside and outside, CISPI 301 or ASTM A888.

2. Design Pressure: Gravity Maximum Design Temperature: 180°F
3. Joints: Heavy duty, neoprene sleeve gasket, ASTM C-564, 300 Series stainless steel shield, clamp, and screws with at least four screw type clamps, FM 1680 or ASTM C1540.
4. Restraints: Install pipe and fittings per the Cast Iron Soil Pipe Institute's Designation 310. Restrain pipe and fittings using an engineered and tested product manufactured for restraining no-hub cast iron soil pipe. Install per manufacturer's recommendations.
5. Adapters: Transitions from cast iron soil pipe to other pipe materials with manufactured adapters. Heavy duty neoprene sleeve gasket, ASTM C-564, 300 Series stainless steel shield, clamp, and screws with not less than four screw type clamps, FM 1680 or ASTM C1540.

C. Cast Iron; Standard Weight Epoxy Coated; No-Hub Sleeve Gaskets:

2.2 COPPER PIPE

A. Copper Pipe; Type L; Solder Joints:

1. Pipe: Type L hard drawn seamless copper tube, ASTM B88.
2. Design Pressure: 175 psi; Maximum Design Temperature: 200°F.
3. Joints: Solder with 100% lead-free solder and flux, ASTM B32.
4. Fittings: Wrought copper solder joint, ANSI B16.22.

2.3 DUCTILE IRON PIPE

A. Ductile Iron Pipe; Pressure Water Pipe; Push-On Joints - Pressure Pipe:

1. Pipe: Ductile iron pressure water pipe, ANSI/AWWA C151/A21.51, 200 psi pressure class, cement-mortar lined per ANSI/AWWA C104/A21.4.
2. Design Pressure: 200 psi. Maximum Design Temperature: 150°F.
3. Fittings: Ductile iron, ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53, 200 psi pressure class, cement-mortar lined per ANSI/AWWA C104/A21.4, push-on joints.
4. Joint: Push-on joint with rubber gasket, ANSI/AWWA C111/A21.11.

2.4 PLASTIC PIPE

A. PVC-DWV or ABS-DWV; Schedule 40; Solvent Weld Joints:

1. Pipe: Schedule 40 rigid, PVC-DWV, or ABS-DWV, normal impact Type l, with plain ends, conforming to ASTM Standards D2665 or D2661. Cellular core piping is not acceptable.
2. Joints: Solvent-weld socket type with solvent recommended by pipe manufacturer.
3. Fittings: PVC-DWV, or ABS-DWV, normal impact Type l, with solvent-weld socket type ends for Schedule 40 pipe.
4. Limits: Schedule 40 PVC-DWV, or ABS-DWV pipe must not be threaded. Do not use where exposed or in return air plenums.
5. Use: Use PVC or ABS only where allowed by local jurisdiction. Comply with all special requirements or limitations.

6. Special Requirements: Provide expansion loop(s) and/or expansion joints in the piping system per the manufacturer's guidelines and as shown on the drawings. Refer to Section 22 05 16 for expansion joint requirements.

B. PVC Perforated; Footing Tile; Schedule 40:

1. Pipe: Schedule 40 Perforated PVC Footing Tile - ASTM D1785/76 or DWV Perforated Footing Tile - ASTM D2665/76.

2.5 VALVES

A. Shutoff Valves:

1. For pipe systems where mechanical press connections are allowed, shutoff valves with mechanical press connections are acceptable subject to the requirements in the paragraphs below.
2. Gate Valves:

a. GA-1: 2" and under, 150# steam @ 406°°F, 300# CWP @ 150°°F, screwed, bronze, rising stem, screwed bonnet. Crane #431, Hammond #IB641, Stockham #B122, Walworth #56, Milwaukee #1150, Watts #B-3210, Nibco T-131.
b. GA-2: 2-1/2" thru 12", 125 psi S @ 353°°°F, 200 psi CWP @ 150°°°F, flanged, iron body, bronze mounted, OS&Y. Crane #465-1/2, Hammond, Stockham #G623, Walworth, Milwaukee #F2885, Watts #F-503, Nibco F-617-0.
c. GA-7: 2-1/2" thru 12", 200# CWP @ 150°F, flanged, iron body, bronze trim, OS&Y. Crane #475-1/2, Hammond #IR1146, Stockham #G624, Walworth #8727F, Milwaukee #F2891, Nibco F-617-0.
d. GA-13: 2" thru 12", 200# CWP, mechanical joint ends, iron body, bronze mounted, double disc, parallel seat, "O" ring stem seals, non-rising stem with mounting flange for indicator post or valve box and 2" square nut, counter-clockwise to open, AWWA. Mueller #A-2380-20, Kennedy #571X.

3. Ball Valves:

a. BA-1: 3" and under, 150 psi saturated steam, 600 psi CWP, full port, screwed or solder ends (acceptable only if rated for soldering in line with 470°F melting point of lead-free solder), bronze body of a copper alloy containing less than 15% zinc, stainless steel ball and trim, Teflon seats and seals. Apollo #77C-140, Stockham #S-255-FB-P-UL, Milwaukee #BA-400, Watts, Nibco #585-70-66, National Utilities Co., RUB.

1) Provide solid extended shaft for all insulated piping.
2) Provide lock out trim for all valves opening to atmosphere installed in domestic water piping over 120°F, heating water piping over 120°F, steam, condensate, boiler feed water piping, and gasoline/kerosene piping, and as indicated on the drawings. Solid extended shaft is not required on valves with lock out trim.

2.6 CHECK VALVES

A. For pipe systems where mechanical press connections are allowed, check valves with mechanical press connections are acceptable subject to the requirements in the paragraphs below.

B. CK-1: 2" and under, 125# steam @ 406°F, 200# CWP @ 150°F, screwed, bronze, horizontal swing. Crane #37, Hammond #IB904, Stockham #B319-Y, Walworth #3406, Milwaukee #509, Watts #G-5000, Nibco T-413B.

C. CK-5: 2" and under, 250# CWP, screwed, all iron, horizontal swing. Crane #346-1/2.

D. CK-20: 2" and larger, 125# CWP, flanged, iron body, cast iron or carbon steel body with stainless steel internals. Hoerbiger Design "CT". Note: Use only for compressor discharge.

2.7 VALVE OPERATORS

A. Provide handwheels for gate valves and gear operators for butterfly valves.

2.8 VALVE CONNECTIONS

A. Provide all connections to match pipe joints. Valves shall be same size as pipe unless noted otherwise.

2.9 CONNECTIONS BETWEEN DISSIMILAR METALS

A. Connections between dissimilar metals shall be insulating dielectric types that provide a water gap between the connected metals, and that either allow no metal path for electron transfer or that provide a wide water gap lined with a non-conductive material to impede electron transfer through the water path.

B. Joints shall be rated for the temperature, pressure, and other characteristics of the service in which they are used, including testing procedure.

C. Aluminum, iron, steel, brass, copper, bronze, galvanized steel and stainless steel are commonly used and require isolation from each other with the following exceptions:

1. Iron and steel connected to each other.
2. Brass, copper, and bronze connected to each other.
3. Brass or bronze valves and specialties connected in closed systems with steel, iron, or stainless steel on both sides of the brass or bronze valves and specialties. Where two or more brass or bronze items occur together, they shall be connected with brass nipples. Brass or bronze valves and specialties cannot be used as a dielectric separation between pipe materials.

D. Dielectric protection is required at connections to equipment of a material different than the piping.

E. Screwed Joints (acceptable up to 2" size):

1. Dielectric waterway rated for 300 psi CWP and 225°F.

2. Manufacturers:

    a. Elster Group ClearFlow fittings
    b. Victaulic Series 647
    c. Grinnell Series 407
    d. Matco-Norca

F. Flanged Joints (any size):

1. Use 1/8" minimum thickness, non-conductive, full-face gaskets.
2. Employ one-piece molded sleeve-washer combinations to break the electrical path through the bolts.
3. Sleeve-washers are required on one side only, with sleeves minimum 1/32" thick and washers minimum 1/8" thick.
4. Install steel washers on both sides of flanges to prevent damage to the sleeve-washer.
5. Separate sleeves and washers may be used only if the sleeves are manufactured to exact lengths and installed carefully so the sleeves must extend partially past each steel washer when tightened.
6. Manufacturers:

    a. EPCO
    b. Central Plastics
    c. Pipeline Seal and Insulator
    d. F. H. Maloney
    e. Calpico

PART 3 - EXECUTION

3.1 PREPARATION

A. Install all products per manufacturer's recommendations.

B. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

C. Remove scale and dirt, on inside and outside, before assembly.

D. Remove all scale, rust, dirt, oils, stickers and thoroughly clean exterior of all bare metal exposed piping, hangers, and accessories in preparation to be painted.

E. Connect to equipment with flanges or unions.

F. Use only piping materials rated for the maximum temperature of the application, e.g., do not use PVC for dishwasher drainage or piping that receives boiler blowdown.

G. Roof Penetration (Vent) Flashing:

1. Built-up Roofing: Flash vents with 3# seamless sheet lead of sufficient size to extend 15" into roofing felts for built-up roofs.

2. Membrane, Metal or Shingled Roofs: Flash vents with premolded pipe flashing cones for single-ply membrane roofs, metal roofs, or shingled roofs.

H. Existing building sewers or building drains which are shown on the documents to be reused shall be inspected and recorded by closed circuit television for their condition. Report findings back to the Architect, Engineer, and Owner before proceeding with work so any necessary rework can take place if needed.

3.2 SYSTEM, PIPING AND VALVE SCHEDULE

A. Cold Water, Hot Water, Tempered Water - Potable and Non-Potable (Above Ground):

1. Copper Pipe; Type L; Solder Joints: All Sizes
2. Shutoff Valves:, BA-1
3. Check Valves: CK-1, CK-14
4. Strainers: ST-1, ST-7

B. Cold Water, Hot Water, Tempered Water - Potable and Non-Potable (Underground):

1. Copper Pipe; Type K; Solder Joints: All Sizes
2. Copper Pipe; Type K; Mechanical Press Connection: 4" and Under

C. Sanitary Waste and Vent, Gravity (Above Ground):

1. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets: 1-1/2" to 15"
2. Copper Pipe: Type DWV; Solder Joints: 1-1/4" to 4"
3. Galvanized Steel; Standard Weight; Threaded Joints: 4" and under

D. Sanitary Indirect Drainage (Above Ground):

1. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets: 1-1/2" to 15"
2. Copper Pipe: Type DWV; Solder Joints: 1-1/4" to 4"

E. Sanitary Waste and Vent, Gravity (Underground - Inside Building):

1. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets: 1-1/2" to 15"
2. PVC-DWV or ABS-DWV; Schedule 40; Solvent Weld Joints: All Sizes

F. Sanitary Waste and Vent, Gravity (Underground - Outside Building):

1. PVC Pressure Pipe; Schedule 40/SDR26; Push-On Joints - Pressure Pipe: All sizes

G. Footing Tile:

1. PVC Perforated; Footing Tile; Schedule 40: All Sizes
2. Polyethylene Corrugated; Footing Tile: All Sizes

3.3 CLEANING PIPING

A. Assembly:

1. Before assembling pipe systems, remove all loose dirt, scale, oil and other foreign matter on internal or external surfaces by means consistent with good piping practice subject to approval of the Architect/Engineer's representative. Blow chips and burrs from machinery or thread cutting operation out of pipe before assembly. Wipe cutting oil from internal and external surfaces.
2. During fabrication and assembly, remove slag and weld spatter from both internal and external joints by peening, chipping and wire brushing.
3. Notify the Architect/Engineer's representative before starting any post erection cleaning in sufficient time to allow witnessing the operation. Consult with and obtain approval from the Architect/Engineer's representative regarding specific procedures and scheduling. Dispose of cleaning and flushing fluids properly.
4. Prior to blowing or flushing erected piping systems, disconnect all instrumentation and equipment, open wide all valves, and be certain all strainer screens are in place.

B. Air Blow:

1. Blow out pipe and components with clean compressed air. Instrument air, argon, nitrogen and sulfuric acid lines shall be blown out with dry, oil free air or nitrogen gas. "Oil Free" is defined as air compressed in a centrifugal, Teflon ring, carbon ring or water pumped air compressor. Where air supply is judged to be inadequate to continually attain cleaning velocity, alternate pressurization and sudden relief procedure may be used until discharge at all blow out points is clean. Use 80-90 psig pressure unless otherwise indicated.
2. Air blow applies to the following systems:

    a. Acetylene
    b. Carbon Dioxide
    c. Nitrogen (use oil free air or nitrogen gas)
    d. Argon (use oil free air or nitrogen gas)
    e. Instrument Air (use oil free air or nitrogen gas)
    f. Distilled Water (use maximum of 50 psig pressure)
    g. Chemical Feed
    h. Air Compressor Intakes
    i. Sulfuric Acid (use oil free air or nitrogen gas)

C. All Water Piping:

1. Flush all piping using faucets, flush valves, etc. until the flow is clean.
2. After flushing, thoroughly clean all inlet strainers, aerators, and other such devices.
3. If necessary, remove valves to clean out all foreign material.

D. Fire Service:

1. Flush all underground piping with minimum flow equal to the system design flow but not less than the following:

    a. 390 gpm for 4" pipes.
    b. 880 gpm for 6" pipes.
    c. 1560 gpm for 8" pipes.

d. 2440 gpm for 10" pipes.
e. 3500 gpm for 12" pipes.

3.4 INSTALLATION

A. General Installation Requirements:

1. Provide dielectric connections between dissimilar metals.
2. Route piping in orderly manner and maintain gradient. Install to conserve building space.
3. Group piping whenever practical at common elevations.
4. Install piping to allow for expansion and contraction without stressing pipe, joints, or equipment.
5. Slope water piping and arrange to drain at low points.
6. Install bell and spigot piping with bells upstream.
7. Where pipe supports are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
8. Seal pipes passing through exterior walls with a wall seal per Section 22 05 29. Provide Schedule 40 galvanized sleeve at least 2 pipe sizes larger than the pipe.
9. All non-potable outlets shall be clearly marked with a permanently affixed laminated sign with 3/8" high lettering saying "Non-Potable Water Not for Human Consumption." Sign shall have black lettering on a yellow background.
10. All vertical pipe drops to sinks or other equipment installed below the ceiling shall be routed within a wall cavity, unless specifically noted otherwise to be surface mounted. For renovation projects, this Contractor is responsible for opening and patching existing walls for installation of piping. Wall patching shall match existing condition.

B. Installation Requirements in Electrical Rooms:

1. Do not install piping or other equipment above electrical switchboards or panelboards. This includes a dedicated space extending 25 feet from the floor to the structural ceiling with width and depth equal to the equipment.

C. Valves/Fittings and Accessories:

1. Install shutoff valves that permit the isolation of equipment/fixtures in each room without isolating any other room or portion of the building. Individual fixture angle stops do not meet this requirement. Exception: Back-to-back rooms in no more than two adjacent rooms.
2. Provide clearance for installation of insulation and access to valves and fittings.
3. Provide access doors for concealed valves and fittings.
4. Install valve stems upright or horizontal, not inverted.
5. Provide one plug valve wrench for every ten plug valves 2" and smaller, minimum of one. Provide each plug valve 2-1/2" and larger with a wrench with set screw.
6. Install corrugated, stainless steel tubing system according to manufacturer's written instructions. Include striker plates to protect tubing from puncture where tubing is restrained and cannot move.

D. Underground Piping:
   1. Install buried water piping outside the building with at least 48 inch of cover. Refer to Section 22 05 00 for Excavation, Fill, Backfill and Compaction requirements
   2. Install buried borosilicate glass pipe with the protective polystyrene covering intact. Lay the pipe on bedding and backfill per manufacturer instructions.
   3. Underground fire protection service piping shall have at least 6-1/2 feet of cover, or as recommended by NFPA 24.
   4. Install thrust blocking and restraints on all underground fire protection service piping per NFPA 24 and as shown on drawings.
   5. Install underground, sleeved, corrugated, stainless steel tubing system according to manufacturer's written instructions. Extend vent from sleeve to exterior of building and terminate with screened elbow.
   6. Direct buried, uninsulated steel pipe shall have a factory applied external protective coating consisting of two coats with an intermediate layer of 18 mil fibrous glass mat. Coating thickness shall total not less than 3/32". The outer coating shall be further protected by a wrapping of heavy Kraft paper. This external protection shall extend and be exposed for a minimum of 1 foot beyond the buried or concealed portion of the pipe.

   7. As an option, the Contractor may provide factory applied protective coatings consisting of a polyethylene plastic film bonded to the pipe surface by a hot applied thermo-plastic adhesive.

   8. Exercise care in handling, storing and laying pipe to avoid damaging factory applied coatings. If any damage occurs, repair the coating to a condition equal to the original.
   9. Field application of protective coatings to joints, fittings and to any damaged factory applied coatings shall be similar to factory applied coatings specified above and shall be done in strict accordance with recommendations of the supplier of pipe coatings.
   10. After completion of the fabrication, laying and field coating of the joints and fittings, but prior to backfilling, inspect the entire line in the presence of the Architect/Engineer's representative with an electronic holiday detector. Any defects in the protective coatings shall be repaired in accordance with requirements for original coatings.
   11. Coat flange bolts and nuts in pits and below ground at the time of installation with a corrosion protective coating.

E. Sanitary and Storm Piping:

   1. Install all sanitary and storm piping inside the building with a slope as shown on the drawings.
   2. Install horizontal offset at all connections to roof drains to allow for pipe expansion.
   3. Slope sanitary and storm piping outside the building to meet invert elevations shown on drawings and to maintain a minimum velocity of 2 feet per second.

4. Sway Bracing: Where horizontal sanitary and/or storm pipes 4 inches and larger change flow direction greater than 45°, rigid bracing or thrust restraints shall be installed to resist movement of the upstream pipe in the direction of pipe flow. The rigid bracing or thrust restraint shall be connected to structure. A change of flow direction from horizontal into a vertical pipe does not require the upstream pipe to be braced.
5. All sanitary and storm piping shall have at least 42" of cover when leaving the building.
6. Starter fittings with internal baffles are not permitted.

F. Siphonic Storm Piping:

1. Siphonic storm drainage is an engineered piping system. All piping components form part of the hydraulic design calculation that has been engineered to create a siphonic action and make the system function. The Contractor must refer to both the layout drawings and design calculation sheets to identify correct configuration, lengths of pipes, locations of bends, wye branches, and reducers. The Architect/Engineer shall be notified of any changes to the original design. The Contractor shall provide certified drawings from manufacturer if not the basis of design.
2. The piping system shall comprise of swept fittings with 1/4 (90°) bend or 1/8 (45°) bends and 1/8 (45°) wye branches. 90° branches (straight or sanitary tees) are not permitted at any time. Where a right-angle branch is required, it shall be made using a 45° wye branch connecting to a 45° bend or a combination wye and 1/8 bend.
3. Cleanout/access points are not permitted.
4. The horizontal pipe shall be installed with top of pipe (crown) level; there shall be no pitch. Any changes in diameter shall be created with the transition slope at the invert. The drawings shall notate the top of pipe level.
5. Reducers (increasers) shall be of the eccentric type and oriented to ensure the crown of the two adjoining diameters remains level and the diameter transitioning sloped pipe is at the invert.

G. Glass Piping:

1. Protect glass piping from all weld spatter.

3.5 PIPE ERECTION AND LAYING

A. Carefully inspect all pipe, fittings, valves, equipment and accessories before installation. Any items that are unsuitable, cracked or otherwise defective shall be removed from the job immediately.

B. All pipe, fittings, valves, equipment and accessories shall have factory applied markings, stampings, or nameplates with sufficient data to determine their conformance with specified requirements.

C. Exercise care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not install any item that is not clean.

D. Until system is fully operational, all openings in piping and equipment shall be kept closed except when actual work is being performed on that item or system. Closures shall be plugs, caps, blind flanges or other items specifically designed and intended for this purpose.

E. Run pipes straight and true, parallel to building lines with minimum use of offsets and couplings. Provide only offsets required to provide needed headroom or clearance and to provide needed flexibility in pipe lines.

F. Make changes in direction of pipes only with fittings or pipe bends. Changes in size only with fittings. Do not use miter fittings, face or flush bushings, or street elbows. All fittings shall be of the long radius type, unless otherwise shown on the drawings or specified.

G. Provide flanges or unions at all final connections to equipment, traps and valves.

H. Arrange piping and connections so equipment served may be totally removed without disturbing piping beyond final connections and associated shutoff valves.

I. Use full and double lengths of pipe wherever possible.

J. Unless otherwise indicated, install all piping, including shutoff valves and strainers, to coils, pumps and other equipment at line size with reduction in size being made only at control valve or equipment.

K. Cut all pipe to exact measurement and install without springing or forcing except in the case of expansion loops where cold springing is indicated on the drawings.

L. Underground pipe shall be laid in dry trenches maintained free of accumulated water. Refer to Section 22 05 00 for Excavation, Fill, Backfill and Compaction requirements.

M. Unless otherwise indicated, branch take-offs shall be from top of mains or headers at either a 45° or 90° angle from the horizontal plane for air lines, and from top, bottom or side for liquids.

N. Do not use geotextile fabric with footing tile if silt content of soil exceeds 40% or if clay content exceeds 50%. The fabric shall be installed around 1" river rock or 2" limestone.

3.6 DRAINING AND VENTING

A. Unless otherwise indicated on the drawings, all horizontal water lines, including branches, shall pitch 1" in 40 feet to low points for complete drainage, removal of condensate and venting.

B. Maintain accurate grade where pipes pitch or slope for venting and drainage. No pipes shall have pockets due to changes in elevation.

C. Provide drain valves at all low points of water piping systems for complete or sectionalized draining.

D. Use eccentric reducing fittings on horizontal runs when changing size of pipes for proper drainage and venting. Install gravity drain pipes with bottom of pipe and eccentric reducers in a continuous line; all other liquid lines with top of pipe and eccentric reducers in a continuous line.

E. Provide air vents at high points and wherever else required to eliminate air in all water piping systems.

F. Install air vents in accessible locations. If necessary to trap and vent air in a remote location, install an 1/8" pipe from the tapping location to an accessible location and terminate with a venting device.

G. All vent and drain piping shall be of same materials and construction for the service involved.

3.7 PLUMBING VENTS

A. Vent as shown on the drawings and in accordance with all codes having jurisdiction.

B. Extend the high side of the soil and waste stacks at least 12" above roof.

C. Flash pipes at the roof with 3# lead sheet. Extend flashing under roofing 15" in all directions from pipe to be flashed. Extend a lead collar up on the outside of pipe to be flashed and extend 1" beyond the top of the pipe. The 1" excess length of collar shall be turned down into the top of the pipe where it shall fit tight to the inside of the pipe.

D. Flash pipes at roof with premolded EPDM pipe flashing cones adhered to roof membrane by General Contractor. Secure top of cone with stainless steel clamp and seal watertight.

E. Increase vent pipes through the roof two pipe sizes with long increasers located at least 12" below the roof.

F. In no case shall the vent through the roof be less than 4" in diameter.

G. Vent pipes through the roof shall be located a minimum of 10 feet from any air intake opening on the roof.

3.8 BRANCH CONNECTIONS

A. For domestic water and vent systems only, make branch connections with standard tee or cross fittings of the type required for the service.

B. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be the size of the largest pipe shown connecting to it.

C. Do not use double wye or double combination wye and eighth bend DWV fittings in horizontal piping.

D. Branch connections from the headers and mains may be mechanically formed using an extraction device. The branch piping connection shall be brazed connection for the following services only:

1. Domestic water piping above ground.

E. Further limit use of mechanically formed fittings as follows:

1. Must have at least same pressure rating as the main.
2. Main must be Type K or L copper tubing.
3. Permanent marking shall indicate insertion depth and orientation.
4. Branch pipe shall conform to the inner curve of the piping main.
5. Main must be 1" or larger.
6. Branch must be 3/4" or larger.

F. Branch connections from headers and mains may be cut into black steel pipe using forged weld-on fittings.

G. Forged weld-on fittings are limited as follows:

1. Must have at least same pressure rating as the main.
2. Main must be 2-1/2" or larger.
3. Branch line is at least two pipe sizes under main size.

3.9 JOINING OF PIPE

A. Solder Joints (Copper Pipe):

1. Make up joints with 100% lead-free solder, ASTM B32. Cut tubing so ends are perfectly square and remove all burrs inside and outside. Thoroughly clean sockets of fittings and ends of tubing to remove all oxide, dirt and grease just prior to soldering. Apply flux evenly, but sparingly, over all surfaces to be joined. Heat joints uniformly so solder will flow to all mated surfaces. Wipe excess solder, leaving a uniform fillet around cup of fitting.
2. Flux shall be non-acid type.
3. Solder end valves may be installed directly in the piping system if the entire valve is suitable for use with 470°F melting point solder. Remove discs and seals during soldering if they are not suitable for 470°F.

B. Push-On Joints - Pressure Pipe (Ductile Iron, PVC Pressure):

1. Joints shall be single gasket type conforming to ANSI A21.11 "Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings". The bell shall have cast or machined gasket socket recesses, a tapered annular opening and flared socket design to provide deflections up to 5°. Plain spigot ends shall be suitably beveled for easy entry into bell, centering in gasket and compression of gasket.
2. The joint shall be liquid tight under all pressures from vacuum to 350 psig.
3. Furnish sufficient lubricant for a thin coat on each spigot end. Lubricant shall be non-toxic, impart no taste or odor to conveyed liquid, and have no deleterious effect on the rubber gasket. Lubricant shall be of such consistency that it can be easily applied to the pipe in hot and cold weather and shall adhere to either wet or dry pipe.
4. Assemble per manufacturer's installation instructions.

C. Solvent Weld Joints (PVC):

1. Make joints with a two-step process. Use primer conforming to ASTM F656 and solvent cement conforming to ASTM D2564.

D. No-Hub Sleeve Gaskets (No-Hub) (Cast Iron Pipe):

1. Gasket shall be heavy weight class, conforming to ASTM C564.
2. The gasket shall have an internal center stop.
3. The gasket shall be covered by a stainless steel band secured with a minimum of four stainless steel bands per fitting/joint.
4. Sleeve gaskets shall be installed in accordance with the manufacturer's installation instructions.

3.10 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfection of the domestic water piping shall be completed within three (3) weeks prior to building occupancy. Contractor is responsible for disinfecting water piping if used by workers during construction; disinfection during construction does not eliminate the requirement for final disinfection prior to occupancy. Flushing of piping shall be completed within two (2) weeks prior to building occupancy.

B. Provide necessary connections at the start of individual sections of mains for adding chlorine.

C. Before starting work, verify system is complete, flushed and clean.

D. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

E. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

F. Bleed water from all outlets to ensure chlorine distribution throughout the entire domestic water system.

G. Verify initial chlorination levels by testing at minimum 15% of outlets located throughout entire building, including the last fixture connected to each main and each branch extending over 50 feet from a main.

H. Maintain disinfectant in system for 24 hours, after which test at minimum 15% of outlets located throughout entire building, including the last fixture connected to each main and each branch extending over 50 feet from a main. If final disinfectant residual tests less than 25 mg/L at any one of the tested outlets, flush the entire system and repeat disinfection and testing procedure.

I. After final disinfectant residuals test at or above 25 mg/L after a minimum 24-hour duration, flush disinfectant from system at a minimum velocity of 3.0 feet/second until residual is equal to that of incoming water or 1.0 mg/L.

J. Take water samples, no sooner than 24 hours after flushing, from 2% of outlets and from water entry. Obtain, analyze, and test samples in accordance with AWWA C651, Section 5 - Verification.

K. Disinfection shall comply with CPC - 609.9: Disinfection of Potable Water Systems.

END OF SECTION 22 10 00

SECTION 22 10 23 - NATURAL GAS AND PROPANE PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe and Pipe Fittings.

B. Valves.

C. Natural Gas Piping System.

1.2 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body. Remanufactured valves are not acceptable.

B. Welding Materials, Procedures, and Operators: Conform to ASME Section 9, ANSI/AWS D1.1, and applicable state labor regulations.

C. Welders Certification: In accordance with ANSI/ASME Sec 9 or ANSI/AWS D1.1.

1.3 SUBMITTALS

A. Submit product data under provisions of Section 22 05 00. Include data on pipe materials, fittings, valves, and accessories.

B. Test Reports: Provide results of piping system pressure test.

C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store and protect piping to prevent entrance of foreign matter into pipe and to prevent exterior corrosion.

B. Deliver and store valves in shipping containers with labeling in place.

1.5 COORDINATION DRAWINGS

A. Reference Coordination Drawings article in Section 22 05 00 for the required natural gas piping system electronic CAD drawings to be provided to Coordinating Contractor for inclusion into composite coordination drawings.

PART 2 - PRODUCTS

2.1 NATURAL GAS (0 to 125 PSI)

A. Design Pressure: 125 psi. Maximum Design Temperature: 350°F

B. Piping - 2" and Under:

1. Pipe: Standard weight steel, threaded and coupled, ASTM A53.
2. Joints: Screwed. (NOTE: For below ground, all sizes to have welded joints.)
3. Fittings: 150# steam - 300# CWP, black malleable iron, banded, ASTM A197, ANSI B16.3.
4. Unions: 250# - 500# CWP, black malleable iron, ANSI B16.39, ground joint with brass seat.

C. Piping - 2-1/2" and Over:

1. Pipe: Standard weight steel, beveled ends, ASTM A53.
2. Joints: Butt welded or flanged.
3. Fittings: Standard weight seamless steel, butt weld type, ASTM A234, Grade I, ANSI B16.9.
4. Flanges: 150# forged steel, weld neck or slip-on, ASTM A181, Grade I, ANSI B16.5. Flange face seal weld (backweld) is required for slip-on flanges.

D. For Underground Gas Piping - Refer to paragraph "Underground Piping Protection."

E. Shutoff Valves/Throttling Valves:

1. For pipe systems where mechanical press connections are allowed, shutoff valves with mechanical press connections are acceptable subject to the requirements in the paragraphs below.
2. BA-13: 2" and under, threaded 600 psi CWP; UL listed for 250# LP, flammable liquid, heating oil, natural and manufactured gases, 150 psi steam, bronze body and chrome plated brass ball, Teflon seats and packing.

a. Manufacturers:

1) Apollo #80-100
2) Nibco #T580-70-UL or #T585-70-UL
3) Watts #B-6000

3. PL-1: 2" and under, 125# steam @ 450°F, 175# CWP @ 180°F, cast iron body, screwed, full port.

a. Manufacturers:

1) Walworth #1700
2) DeZurik #425, S-RS49

4. PL-2: 2-1/2" thru 4", 125# steam @ 450°F, 175# CWP @ 180°F, flanged, cast iron body, full port.

a. Manufacturers:

1) Walworth #1700F
2) DeZurik #425, F-RS49

F. Gas Seismic Valves:

1. Provide a valve consisting of a swing check valve arrangement with an acceleration-sensitive triggering mechanism. The trip mechanism shall consist of a steel ball resting on a tapered cup-shaped support. The trip mechanism shall be factory set and sealed. A sight glass shall be provided so that the Open or Closed indicator can be seen, and the trip mechanism status of the valve can be easily determined. The valve assembly shall be certified by the California Sate Architect's Office, approved by the local authority, and meet the requirements of ANSI Z21.70 and ASCE 25-97. Refer to schedule for model number.

G. Check Valves:

1. For pipe systems where mechanical press connections are allowed, check valves with mechanical press connections are acceptable subject to the requirements in the paragraphs below.
2. CK-1: 2" and under, 125# steam @ 406°F, 200# CWP @ 150°F, screwed, bronze, horizontal swing.

a. Manufacturers:

1) Crane #37
2) Hammond #IB904
3) Stockham #B319-Y
4) Walworth #3406
5) Milwaukee #509
6) Watts #B-5000
7) Nibco Y-413B

3. CK-13: 2-1/2" thru 12", 200# CWP, double disc wafer type, iron body, bronze or aluminum-bronze discs, 316SS shaft and spring, Viton, EPDM or BUNA-N, Cv of at least 700 in 6" size.

a. Manufacturers:

1) Mueller Steam Specialty Co. #71-AHB-6-H
2) Stockham #WG-961 EPDM or #WG970 BUNA
3) NIBCO W-920-W
4) Crane

H. Strainers:

1. For pipe systems where mechanical press connections are allowed, strainers with mechanical press connections are acceptable subject to the requirements in the paragraphs below.

2. ST-2: Cast iron body, 125 lb. flanged ends, bolted cover, 125 psi S @ 350°F, 175 psi CWP @ 150°F.

    a. Manufacturers:

        1) Armstrong #A1FL
        2) Metraflex #TF
        3) Mueller Steam Specialty Co.#751
        4) Sarco #CI-125
        5) Watts #77F-D

3. ST-4: Cast iron body, screwed ends, screwed cover, 250# steam @ 406°F, 300# CWP @ 150°F.

    a. Manufacturers:

        1) Armstrong #A1SC
        2) Metraflex #SM
        3) Mueller Steam Specialty Co. #11
        4) Sarco #IT

2.2 STRAINERS

A. Unless otherwise indicated, strainers shall be Y-pattern and have stainless steel screens with perforations as follows:

1. Gases:

    a. 1/4" - 2": 1/32" perforations
    b. 2-1/2" - 10": 3/64" perforations
    c. 12" - 18": 1/16" perforations

B. Furnish pipe nipple with shutoff valve to blow down all strainer screens.

C. Use iron body strainers in ferrous piping.

2.3 DRAIN VALVES AND BLOWDOWN VALVES

A. Drain valve and blowdown valve shall mean a shutoff valve as specified for the intended service with added 3/4" male hose thread outlet, cap, and retaining chain.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends, remove burrs, bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Remove all scale, rust, dirt, oils, stickers and thoroughly clean exterior of all bare metal exposed piping, hangers, and accessories in preparation to be painted.

D. Connect to all equipment with flanges or unions.

E. After completion, fill, clean, and treat systems. Refer to Section 23 25 00 for treatment.

3.2 TESTING PIPING

A. Low Pressure - Up to 1 psi:

1. Test piping with 20 psi air pressure. System must hold this pressure without adding air for two hours.

B. High Pressure - Above 1 psi:

1. Test piping with compressed air at twice the operating gas pressure, but at least 20 psi. System must hold this pressure without adding air for two hours.

C. A non-combustible odorant, such as oil of wintergreen, may be added to help locate leaks.

3.3 CLEANING PIPING

A. Assembly:

1. Prior to assembly of pipe and piping components, remove all loose dirt, scale, oil and other foreign matter on internal or external surfaces by means consistent with good piping practice subject to approval of the Architect/Engineer. Blow chips and burrs out of pipe before assembly. Wipe cutting oil from internal and external surfaces.
2. During fabrication and assembly, remove slag and weld spatter from both internal and external joints by peening, chipping and wire brushing to the degree consistent with good piping practices.
3. Notify the Architect/Engineer prior to starting any post erection cleaning operation in time to allow witnessing the operation. Properly dispose of cleaning and flushing fluids.
4. Prior to blowing or flushing erected piping systems, disconnect all instrumentation and equipment, open wide all valves, control valves, and balance valves, and verify all strainer screens are in place.

3.4 INSTALLATION

A. Route piping in orderly manner, straight, plumb, with consistent pitch, parallel to building structure, with minimum use of offsets and couplings. Provide only offsets required for needed headroom or clearance and needed flexibility in pipe system.

B. Install piping to conserve building space, and not interfere with other work.

C. Do not install piping or other equipment above electrical switchboards or panelboards. This includes a dedicated space extending 25 feet from the floor to the structural ceiling with width and depth equal to the equipment.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Install thrust blocking and restraints on all buried piping at elbows and other changes in pipe direction.

G. Provide chain operators for all valves over 2" size that are over 10'-0" above finished floor. Extend to 7'-0" above finished floor.

H. Provide valve position indicator on all valves 10'-0" or greater above finish floor and not located above ceiling.

I. Provide clearance for access to valves and fittings.

J. Provide access doors where valves are not exposed.

K. Prepare pipe, fittings, supports, and accessories for finish painting.

L. Install valves with stems upright or horizontal, not inverted.

M. Provide shutoff valves and flanges or unions at all connections to equipment, traps, and items that require servicing.

N. Provide shutoff valves to isolate part of systems and vertical risers.

O. Provide shutoff valves to boilers and water heaters in readily accessible location, maximum 6 feet above finished floor, within 6 feet of boiler connection per ASME CSD-1.

P. Arrange piping and piping connections so equipment may be serviced or totally removed without disturbing piping beyond final connections and associated shutoff valves.

Q. Reducers are generally not shown. Where pipe sizes are not shown, the larger size in either direction shall continue through the fitting nearest to the indication of a smaller pipe size.

R. Lay all underground piping in trenches. Provide and operate pumping equipment to keep trenches free of water.

S. Seal pipes passing through exterior walls with a wall seal per Section 23 05 29. Provide Schedule 40 galvanized sleeve at least 2 pipe sizes larger than the pipe.

T. Refer to Section 23 05 00 for Excavation, Fill, Backfill and Compaction requirements.

U. Underground Piping Protection:

1. Direct buried, uninsulated steel pipe shall have a factory applied external protective coating consisting of two coats with an intermediate layer of 18 mil fibrous glass mat. Coating thickness shall total not less than 3/32". The outer coating shall be further protected by a wrapping of heavy Kraft paper. This external protection shall extend and be exposed for a minimum of 1 foot beyond the buried or concealed portion of the pipe.
2. As an option, the Contractor may provide factory applied protective coatings consisting of a polyethylene plastic film bonded to the pipe surface by a hot applied thermo-plastic adhesive.
3. Exercise care in handling, storing and laying pipe to avoid damaging factory applied coatings. If any damage occurs, repair the coating to a condition equal to the original.
4. Field application of protective coatings to joints, fittings and to any damaged factory applied coatings shall be similar to factory applied coatings specified above and shall be done in strict accordance with recommendations of the supplier of pipe coatings.
5. After completion of the fabrication, laying and field coating of the joints and fittings, but prior to backfilling, inspect the entire line in the presence of the Architect/Engineer's representative with an electronic holiday detector. Any defects in the protective coatings shall be repaired in accordance with requirements for original coatings.
6. Coat flange bolts and nuts in pits and below ground at the time of installation with a corrosion protective coating.

V. All vertical pipe drops to equipment installed below the ceiling shall be routed within a wall cavity, unless specifically noted otherwise to be surface mounted. For renovation projects, this Contractor is responsible for opening and patching existing walls for installation of piping. Wall patching shall match existing condition.

W. Install underground plastic pipe with an electrically continuous corrosion-resistant tracer wire (minimum AWG 14) or tape per section 22 05 53 to facilitate locating. One end of the tracer wire or tape shall be brought aboveground at a building wall or riser.

X. Install corrugated, stainless steel tubing system according to manufacturer's written instructions. Include striker plates to protect tubing from puncture where tubing is restrained and cannot move.

Y. Install underground, sleeved, corrugated, stainless steel tubing system according to manufacturer's written instructions. Extend vent from sleeve to exterior of building and terminate with screened elbow.

3.5 BONDING AND GROUNDING

A. Each above ground portion of a corrugated stainless steel tubing gas piping systems shall be bonded to the electrical service grounding electrode system. The bonding jumper shall connect to a metallic pipe or fitting between the point of delivery and the first downstream corrugated stainless steel tube fitting. The bonding jumper shall not be smaller than 6 AWG copper wire or equivalent. Gas piping systems that contain one or more segments of corrugated stainless steel tubing shall be bonded in accordance with this section.

B. Each above ground portion of a gas piping system, other than corrugated stainless steel tubing systems, that is likely to become energized shall be electrically continuous and bonded to an effective ground-fault current path. Gas piping, other than corrugated stainless steel tubing, shall be considered to be bonded when it is connected to appliances that are connected to the appliance grounding conductor of the circuit supplying that appliance.

C. Gas piping shall not be used as a grounding conductor or electrode.

D. Where a lightning protection system is installed, the bonding of the gas piping shall be in accordance with NFPA 780, Standard for the Installation of Lightning Protection Systems.

3.6 PIPE ERECTION AND LAYING

A. Carefully inspect all pipe, fittings, valves, equipment and accessories prior to installation. Immediately reject and remove from the job any items which are unsuitable, cracked or otherwise defective.

B. All pipe, fittings, valves, equipment and accessories shall have factory-applied markings, stampings, or nameplates sufficient to determine their conformance with specified requirements.

C. Exercise care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not erect or install any unclean item.

D. During construction, until system is fully operational, keep all openings in piping and equipment closed at all times except when actual work is being performed on that item. Closures shall be plugs, caps, blind flanges or other items designed for this purpose.

E. Change direction of pipes only with fittings or pipe bends. Change size only with fittings. Do not use miter fittings, face or flush bushings, or street elbows. All fittings shall be long radius type, unless otherwise shown on the drawings or specified. Construct welded elbows of angles not available as standard fittings by cutting and welding standard elbows to form smooth, long radius fittings.

F. Use full and double lengths of pipe wherever possible.

G. Cut all pipe to exact measurement and install without springing or forcing.

H. Do not create, even temporarily, undue loads, forces or strains on valves, equipment or building elements.

I. Underground pipe shall be laid in dry trenches maintained free of accumulated water. Provide and operate sufficient pumping equipment to maintain excavations, trenches and pits free of water. Dispose of pumped water so operation areas and other facilities are not flooded. Pipe laying shall follow excavating as closely as possible.

3.7 DRAINING AND VENTING

A. Unless otherwise indicated on the drawings, all horizontal pipes, including branches, shall pitch 1" in 40 feet to low points for complete drainage.

B. Use eccentric reducing fittings on horizontal runs when changing size for proper drainage and venting. Install gas pipes with bottom of pipe and eccentric reducers in a continuous line.

C. Provide drip legs at low points and at the base of all risers in gas pipes. Drip legs shall be full line size on pipes through 4" and at least 4", but not less than half line size over 4". Drip legs shall be 12" minimum length, capped with a reducer to a drain valve.

3.8 BRANCH CONNECTIONS

A. Make branch connections with standard tee or cross fittings of the type required for the service unless otherwise specified herein or detailed on the drawings.

B. At the option of the Contractor, branch connections from headers and mains may be cut into black steel pipe using forged weld-on fittings.

C. Use of forged weld-on fittings is also limited as follows:

1. Must have at least same pressure rating as the main.
2. Header or main must be 2-1/2" or over.
3. Branch line is at least two pipe sizes under header or main size.

D. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be the size of the largest pipe shown connecting to it.

E. All branch piping connections for natural gas shall take off on the top or on the side of the main.

3.9 JOINING OF PIPE

A. Threaded Joints:

1. Ream pipe ends and remove all burrs and chips.
2. Protect plated pipe and valve bodies from wrench marks when making up joints.
3. Apply gas-rated Teflon tape or thread compound to male threads.

B. Flanged Joints:

1. Steel flanges shall be raised face.

2. Bolting for services up to 500°F shall be ASTM A307 Grade B with square head bolts and heavy hexagonal nuts conforming to ANSI B18.2.1 "Square and Hex Bolts" and B18.2.2 "Square and Hex Nuts".
3. Torque bolts in at least three passes, tightening to 1/3, 2/3, and final torque in a cross pattern with an indicating torque wrench for equal tension in all bolts.
4. Gaskets for flat face flanges shall be full face type. Gaskets for raised faced flanges shall conform to requirements for "Group I Gaskets" in ANSI B16.5. Unless otherwise specified gaskets shall meet the following requirements:

    a. Gasket material and thickness approved by manufacturer for intended service, chemical compatibility, pipe system test pressure, and operating temperature range.
    b. Maximum pressure rating of at least 250 psig.
    c. Minimum temperature rating: -10°F.
    d. Maximum temperature rating of at least 170°F for water systems operating 140°F and less.

C. Welded Joints:

1. Welding of all pipe joints, both as to procedures and qualification of welders, shall be in accordance with Section IX, ASME "Boiler & Pressure Vessel Code" unless local codes take precedence.
2. Furnish certificates qualifying each welder to the Owner's Representative prior to start of work.
3. The Owner's Representative reserves the right to require qualifying demonstration, at the Contractor's expense, of any welders assigned to the job.
4. Ends of pipe and fittings to be joined by butt-welding shall be beveled, cleaned to bare metal and internal diameters aligned before tack welding.

3.10 PAINTING EXPOSED PIPE

A. Paint all outdoor exposed natural gas piping the color selected by Owner or Architect/Engineer.

3.11 SERVICE CONNECTIONS

A. Provide new gas service complete with gas meter and regulators. Verify gas service pressure with the Utility Company.

END OF SECTION 22 10 23

SECTION 22 10 30 - PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cleanouts.

B. Traps.

C. Trap Seals and Primers.

D. Floor Drains and Sinks

E. Hub Drains and Standpipes

F. Backflow Preventers.

G. Unions.

H. Balancing Valves.

I. Water Hammer Arresters.

J. Dielectric Fittings (Connections Between Dissimilar Metals).

K. Air Vents.

L. Drain Valves.

M. Relief Valves.

1.2 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

B. Piping, Fittings, Valves, and Flux for Potable Water Systems: All components shall be lead free per Federal Act S.3874, Reduction of Lead in Drinking Water Act.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 22 05 00.

B. Include sizes, rough-in requirements, service sizes, and finishes.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Provide cleanouts as shown and specified on the drawings as well as required by code.

B. Coordinate floor cleanout cover with surrounding floor finish. Provide either solid, recessed for tile or terrazzo or carpet marker as applicable.

C. Cleanouts on exposed pipes shall be cast iron with heavy duty cast brass plug with raised head.

D. Cleanout shall be same size as the pipe up to 6" and 6" for larger pipes.

2.2 YARD CLEANOUTS

A. Provide yard cleanouts as shown and specified on the drawings as well as required by code.

B. Cleanout shall be same size as pipe up to 6" and 6" for larger pipes.

2.3 TRAPS

A. Provide all individual connections to the sanitary system with P-traps, except where such drains discharge directly into a properly trapped collection basin or sump. Unless otherwise specified or shown, traps shall be:

1. Chromium plated cast brass when used with plumbing fixtures or when installed exposed in finished spaces.
2. Insulated at accessible lavatories.
3. Cast iron, deep-seal pattern where concealed above ceiling, below grade or in unfinished areas.
4. Deep-seal pattern of the same material and/or coating where drainage lines are of special materials or coatings such as polypropylene, PVDF, CPVC, etc.

B. All traps shall have accessible, removable cleanouts, except where installed on floor drains with removable strainers.

C. Each trap shall be completely filled with water at the end of construction but before building turnover to the Owner. All floor drains, floor sinks, trench drains, etc. shall be filled with water and a 1/2" minimum layer of mineral oil.

2.4 TRAP SEALS

A. Provide trap seals as specified on the drawings.

2.5 FLOOR DRAINS

A. Floor drains shall be in the form of a receptor with grate/strainer set flush with the surrounding floor.

B. Provide floor drains and sinks as shown and specified on the drawings as well as required by code.

2.6 HUB DRAINS AND STANDPIPES

A. A hub drain shall be in the form of a hub or pipe without a grate/strainer extending through the floor for receiving indirect waste. A hub drain has a flood level rim above the finished floor.

B. Provide hub drains as shown and specified on the drawings as well as required by code.

2.7 BACKFLOW PREVENTERS

A. Provide backflow preventers as shown and specified on the drawings as well as required by code.

2.8 UNIONS

A. Copper pipe - wrought copper fitting - ground joint.

2.9 BALANCING VALVE

A. Rated for 125 psi working pressure and 250°F operating temperature, taps for determining flow with a portable meter, positive shutoff valves for each meter connection, memory feature, tight shutoff, and a permanent pressure drop between 1' and 2' water column at full flow with valve 100% open. Furnish with molded, removable insulation covers.

B. Provide a nomograph to determine flow from meter reading (and valve position on units which sense pressure across a valve). Graph shall extend below the specified minimum flow.

C. Furnish one meter kit equivalent to Bell & Gossett Model RO-5 meeting the following requirements:

1. Carrying case with handle.
2. Pressure gauge with 0-25 feet of head scale with 3.0% full scale accuracy.
3. High and low side hoses with 5 feet length and 250 psig pressure rating, equipped with shutoff valves, vent valves, and probes for insertion into pressure and temperature plugs.
4. Coordinate with the Mechanical Contractor if a meter kit is also required in Section 23 21 00. It is not our intent to require two identical kits, rather it will be acceptable to provide only one kit to the owner which can be used with both plumbing and hydronic piping systems.

D. Flow rate of 0.5 GPM or larger: Valves in copper piping shall be brass or bronze. Acceptable Manufacturers: Flow Design "Accusetter", Preso "B+", Armstrong "CVB", Bell & Gossett "Circuit Setter Plus", Griswold "Quickset", Gerand "Balvalve Venturi" or Nibco Globe Style balancing valve.

E. Flow rate less than 0.5 GPM: Valves in copper piping shall be brass or bronze. Cv value shall be less than 1.0 when valve is completely open, and minimum balanceable flow rate shall not exceed 0.1 GPM with a meter reading of at least 2.5 feet. Acceptable manufacturers: Bell & Gossett "Circuit Setter RF", Flow Design, Preso, Armstrong, Griswold, Gerand, or Nibco balancing valve.

F. Manufacturer shall size balancing valves for the scheduled flow rate. Flow rate shall be measurable on manufacturer's standard meters.

2.10 WATER HAMMER ARRESTERS

A. Provide water hammer arresters as shown and specified on the drawings as well as required by code.

B. ANSI A112.26.1; sized and located in accordance with PDI WH-201, precharged for operation between -100°F and 300°F and maximum 250 psig working pressure.

2.11 DIELECTRIC FITTINGS (CONNECTIONS BETWEEN DISSIMILAR METALS)

A. Connections between dissimilar metals shall be insulating dielectric types that provide a water gap between the connected metals, and that either allow no metal path for electron transfer or that provide a wide water gap lined with a non-conductive material to impede electron transfer through the water path.

B. Joints shall be rated for the temperature, pressure, and other characteristics of the service in which they are used, including testing procedure.

C. Aluminum, iron, steel, brass, copper, bronze, and stainless steel are commonly used and require isolation from each other with the following exceptions:

1. Iron, steel, and stainless steel connected to each other.
2. Brass, copper, and bronze connected to each other.
3. Brass or bronze valves and specialties connected in closed systems with steel, iron, or stainless steel on both sides of the brass or bronze valves and specialties. Where two or more brass or bronze items occur together, they shall be connected with brass nipples. Brass or bronze valves and specialties cannot be used as a dielectric separation between pipe materials.

D. Dielectric protection is required at connections to equipment of a material different than the piping.

E. Screwed Joints (acceptable up to 2" size):

1. Dielectric waterway rated for 300 psi CWP and 225°F.
2. Acceptable Manufacturers: Elster Group ClearFlow fittings, Victaulic Series 47, Grinnell Series 407, Matco-Norca.

F. Flanged Joints (any size):

1. Use 1/8" minimum thickness, non-conductive, full-face gaskets.

2. Employ one-piece molded sleeve-washer combinations to break the electrical path through the bolts.
3. Sleeve-washers are required on one side only, with sleeves minimum 1/32" thick and washers minimum 1/8" thick.
4. Install steel washers on both sides of flanges to prevent damage to the sleeve-washer.
5. Separate sleeves and washers may be used only if the sleeves are manufactured to exact lengths and installed carefully so the sleeves must extend partially past each steel washer when tightened.
6. Acceptable Manufacturers: EPCO, Central Plastics, Pipeline Seal and Insulator, F. H. Maloney, or Calpico.

2.12 AIR VENTS

A. Provide means for venting air at all high points in the piping system and at all other points where air may be trapped.

B. At end of main and other points where large volume of air may be trapped - Use 1/4" globe valve, angle type, 125 psi, Crane #89, attached to coupling in top of main, 1/4" discharge pipe turned down with cap.

2.13 DRAIN VALVES

A. Drain valves shall be shutoff valves as specified for the intended service with added 3/4" male hose thread outlet and cap.

2.14 RELIEF VALVES

A. RV-4: (Domestic Hot Water) Pressure and Temperature relief, cast bronze body and internal parts, stainless steel spring, test lever, threaded inlet and outlet. Maximum setting of 150 psi and 210°°F temperature. Capacities ASME certified and labeled. Acceptable Manufacturers: Cash Series FV, Watts #40, #120, #N240, #340.

PART 3 - EXECUTION

3.1 INSTALLATION AND APPLICATION

A. Coordinate construction to receive drains at required invert elevations.

B. Install all items per manufacturer's instructions.

C. Water Hammer Arresters:

1. Install water hammer arresters in accessible locations. Provide access doors as required. Coordinate type with Architect/Engineer/Owner.
2. Water hammer arrestors shall be installed in cold and hot water lines upstream of all plumbing fixtures or equipment, with a quick acting valve or multiple quick acting valves. Quick acting valves shall be defined as solenoid actuated valves, manual flush valves, sensor activated faucets and flush valves, squeeze handle spray faucets, and other similar type valves.

3. Install multiple water hammer arrestors in toilet group branch piping greater than 20 feet in developed length from the cold and hot water mains.

D. Cleanouts:
1. Provide cleanouts where shown on the drawings and as required by code, but in no case farther apart than 50 feet in pipe less than 6" size and 100 feet apart in 6" and larger pipes inside the building. Provide cleanouts at bases of all sanitary and storm risers as shown on the drawings and as required by code.
2. Extend cleanouts to the floor with long sweep elbows.
3. Install a full size, two-way cleanout within 5 feet of the foundation inside or outside of building.
4. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with graphite and linseed oil. Ensure clearance at cleanouts for rodding of drainage system.
5. Wall cleanouts shall be installed above the flow line of the pipe they serve, but no less than 12" above the finished floor.

E. Yard Cleanouts:

1. Install cleanouts on maximum 90 foot centers (including riser) for pipes 8" and smaller.
2. Extend cleanout to grade. Encase cleanout in 5" thick concrete pad extending 6" beyond cleanout, set low enough not to interfere with lawn mowers.

F. Trap Seals:

1. Install trap guard on drains not receiving continuous discharge and subject to drying out.

G. Floor Drains and Floor Sinks:

1. Drains in upper floors shall have a flashing of EPDM or similar membrane sheet. The sheet shall be at least 36" X 36" square with the drain in the center. Clamp membrane in auxiliary clamping ring of floor drain. Membrane is not required if upper floor construction is single pour, cast-in-place concrete.
2. Use alternate sealing method when installing drains in existing floor slabs.
3. Coordinate sloping requirements with the architectural plans and specifications.
4. Top of floor drain and sinks grate/strainer shall not extend above the finished floor elevation.
5. Top of floor drain and sink grate/strainer shall not extend above the finished floor elevation. Grate/strainer shall be installed flush with surrounding finished floor. Should the Plumbing Contractor believe this presents a conflict with code, the issue should be evaluated before installation of the floor drain or sink begins. Proceeding with installing a floor drain or sink raised above the finished floor without prior approval will result in the Contractor being required to remove the drain or sink in question and reinstall it at the approved elevation.

H. Hub Drains and Standpipes:

1. The top of a hub drain/standpipe shall extend above the finished floor elevation. Refer to drawings for dimensions above the finished floor.

2. Access shall be provided to drains and standpipes for rodding.

I. Backflow Preventer:

1. Provide an air gap fitting and piping to drain. On 2-1/2" and larger units, install a tail piece from air gap fitting to drain to prevent water from spraying out of drain air gap receptor. Maintain air gap distance required by Code.
2. Units shall be field tested and tagged in accordance with manufacturer's instructions and applicable codes by a certified tester before initial operation.
3. Install unit between 12" and 60" above finish floor.

J. Balancing Valves:

1. Install balancing valves with straight, unobstructed pipe section both upstream and downstream as required, per manufacturer's installation instructions.

END OF SECTION 22 10 30

SECTION 22 11 23 - DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Domestic Water In-Line Circulators.

1.2 SUBMITTALS

A. Submit shop drawings under provisions of Section 22 05 00.

B. Submit certified pump performance curves with pump and system operating point plotted. Include NPSH curve when applicable.

C. Pumps with motors operating above the RPM the pump curves are based on shall have impellers trimmed to deliver GPM and head scheduled.

D. Submit certification that pumps, accessories, and components will withstand seismic forces defined in Section 22 05 50. Include the following:

1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

PART 2 - PRODUCTS

2.1 GENERAL

A. Statically and dynamically balance rotating parts.

B. Construction shall permit complete servicing without breaking piping or motor connections.

C. Pumps shall operate at 1750 rpm unless specified otherwise.

D. Pump connections shall be flanged, whenever available.

E. Domestic hot water pumps shall be suitable for 225°F water.

F. Motors shall comply with Section 22 05 13.

G. Submitted pump selections must have a diameter impeller that meets or exceeds the scheduled pump. The inlet and discharge pipe sizes shall also meet or exceed the scheduled pump.

2.2 DOMESTIC WATER IN-LINE CIRCULATORS

A. Provide pumps as specified on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Installation Requirements:

1. Install all products per manufacturer's recommendations.
2. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

B. In-Line Pump:

1. Support in-line pumps individually so there is no strain on the piping. Support pump so no weight is carried on pump casings. Install with a minimum of five diameters of straight pipe on pump suction and discharge.
2. Ensure pumps operate at specified fluid temperatures without vapor binding or cavitation, are non-overloading in parallel or individual operation, and operate within 25% of midpoint of published maximum efficiency curve.
3. Pumps shall be factory aligned. If alignment is not satisfactory, as determined by the Architect/Engineer, manufacturer shall provide a factory trained representative to field align the shafts.
4. Alignment shall be inspected and approved by a factory trained representative. If alignment is not satisfactory, representative shall field align this shaft.

C. Pump without VFD or ECM:

1. For pumps not powered by a VFD, trim impeller to meet maximum operating conditions. Coordinate final trimmed diameter with Testing, Adjusting, and Balancing Contractor.

END OF SECTION 22 11 23

SECTION 22 30 00 - PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Water Heaters.

1.2 QUALITY ASSURANCE

A. Products and installation of specified products shall conform to recommendations and requirements of the following organizations:

1. American Gas Association (AGA).
2. National Sanitation Foundation (NSF).
3. American Society of Mechanical Engineers (ASME).
4. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
5. National Electrical Manufacturers' Association (NEMA).
6. Underwriters' Laboratories (UL).

B. Water Heater Performance Requirements: Equipment efficiency not less than prescribed by ASHRAE 90.1 when tested in accordance with DOE 10 CFR, ANSI Z21.10.1 and ANSI Z21.10.3.

C. Conform to ASME Section VIII for construction of water heaters and heat exchangers. Provide boilers registered with National Board of Boiler and Pressure Vessel Inspectors.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 22 05 00.

B. Include dimension drawings of water heaters indicating components and connections to other equipment and piping.

C. Include heat exchanger dimensions, size of tappings, and performance data.

D. Include dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

E. For equipment connected to an electric power source, submit short circuit rating (SCCR) of integrated unit.

F. Submit manufacturer's installation instructions including control and electrical power/controls wiring diagrams.

G. Submit manufacturer's certificate that pressure vessels meet or exceed specified requirements.

H. Submit operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

I. Submit certification that, water heaters, accessories, and components will withstand seismic forces defined in Section 22 05 50. Include the following:

1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

J. Submit a current water analysis from the actual water source serving the existing building for softening equipment verification before sending shop drawings to the Architect/Engineer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.5 REGULATORY REQUIREMENTS

A. Water heaters shall conform to AGA, ANSI/NFPA 54, ANSI/NFPA 70, ANSI/UL 1453 as applicable.

B. Conform to ANSI/ASME Section 8 Division 1 for fabrication of steel pressure vessels.

C. Conform to ANSI/ASME Section 10 for manufacture of fiber-reinforced plastic pressure vessels.

PART 2 - PRODUCTS

2.1 WATER HEATERS

A. All water heaters shall be as scheduled on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all items in accordance with manufacturer's instructions.

3.2 WATER HEATER INSTALLATION

A. Install water heaters on concrete bases. Coordinate sizes and locations of concrete bases. Refer to Section 22 05 29.

B. Install water heaters level and plumb, according to drawings, manufacturer's instructions, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend drain piping full size from relief valve and discharge by positive air gap onto closest floor drain. Discharge pipe material shall be same as domestic water piping.

D. Install gas water heaters according to NFPA 54.

END OF SECTION 22 30 00

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. All plumbing fixtures.

1.2 SUBMITTALS

A. Submit product data under provisions of Section 22 05 00. Submittals shall include fixture carriers for record purposes only. Architect/Engineer does not review or approve carriers except for manufacturer.

B. Include fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. For fixtures and trim requiring electrical connections, submit product data indicating general assembly, components, electrical power/controls wiring diagrams, and service connections.

PART 2 - PRODUCTS

2.1 DSA FIXTURE REQUIREMENT

A. Plumbing fixtures and accessories provided in a toilet room or bathing room are required to comply with CBC Section 11B-213.2 and shall comply with CBC Section 11B-213.3.

B. Effective March 1, 2017, all single-user toilet facilities shall be identified as Gender-Neutral facilities by a door symbol that complies with CBC Sections 11B-216.8 and 11B-703.2.6.3. No pictogram, text, or braille is required on the symbol. If tactile jamb signage is provided, the signage shall comply with the appropriate technical requirements of CBC Section 11B-703. Examples of appropriate designations are "ALL-GENDER RESTROOM", "RESTROOM" or "UNISEX RESTROOM". DSA BU 17-01.

C. Accessible plumbing fixtures shall comply with all the requirements in CBC Division 6.

D. Clearance around accessible water closets and in toilet compartments shall be 60 inches minimum measured perpendicular from the side wall and 56 inches minimum measured perpendicular from the rear wall per CBC Section 11B-604.4.1.

E. Heights and location of all accessible fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.

F. Fixture controls shall comply with CBC Sections 11B-601.3 for drinking fountains, 11B-604.6 for water closets, 11B-604.9.5 for children's water closets, 11B-605.4 for urinals, 11B-606.4 for lavatories and sinks, 11B-607.5 for bathtubs, 11B-608.5 for showers, and 11B-611.3 for washing machines and clothes dryers.

G. Accessible sinks shall be 6-1/2” deep maximum. Sinks shall be mounted with the front of the higher of the rim and counter surface 34” maximum above the finish floor or ground.

H. Water supply and drain pipes under lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories and sinks. CBC Section 11B-606.

2.2 MATERIALS

A. Wall Hung Fixture Carriers:

1. Material: All Metal, ASME/ANSI A112.6.1M.
2. Manufacturers:

a. Zurn
b. Smith
c. Wade
d. Josam
e. Watts
f. Mifab.

3. Water closet carrier shall be rated to support 500 lbs. unless noted otherwise on the drawings.

B. All fixtures shall be as scheduled on the drawings.

C. All china shall be from the same manufacturer where possible.

D. All lavatory and sink trim shall be from the same manufacturer where possible.

E. All fixtures shall be lead free. Faucets, traps, stops, and other fixture accessories shall not contain more lead than allowed per the latest State or Federal Act.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Installation Requirements:

1. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
2. Install each fixture with trap easily removable for servicing and cleaning. Use screwed tailpiece couplings. Connect fixture waste to stack with slip fitting.
3. Provide fixtures with chrome plated rigid or flexible supplies, loose key stops, reducers, and escutcheons.
4. Install components level and plumb.

5. Caulk joint between finish floor and floor mounted fixtures and between finish walls and wall mounted fixtures with silicon caulk. Caulk the joint, between rim and fixture where a fixture builds into a counter top, with caulking compound. Refer to DIVISION 7 for "Caulking" requirements. Color to match fixture.
6. Where there is a possibility of water following pipe brackets, etc., into a wall; caulk escutcheons, space around brackets, etc., to exclude water. Refer to DIVISION 7 for "Caulking" requirements.
7. Refer to architectural drawings for fixture mounting heights.
8. All non-potable outlets shall be clearly marked with a permanently affixed laminated sign with 3/8" high lettering saying "Non-Potable Water Not for Human Consumption." Sign shall have black lettering on a yellow background.

B. Wall-Mounted Fixture Requirements:

1. All wall-mounted fixtures shall have compatible carriers designed for their intended service and suitable for the space available and configuration of fixtures. All carriers shall extend to the floor and be anchored to the slab.

C. Floor-Mounted Fixture Requirements:

1. Where floor mounted fixtures are installed on a sloped floor, the open void below the fixture shall be grouted, leveled, and caulked to eliminate stress on the fixture and to prevent water migration to the floor below.

D. Exposed or Inside Accessible Cabinets Traps, Valve and Pipe Requirements:

1. All traps exposed under fixtures or inside accessible cabinets shall be chrome plated brass.
2. All water or waste piping for plumbing fixtures that is exposed or inside cabinets shall be chrome plated.
3. All exposed flush valves for water closets and urinals shall have a chrome plated hanger to anchor the piping to the wall.
4. All exposed water supply piping and fittings in a finished space to a shower valve, hose bibb, or other water outlet shall be chrome plated.

E. ADA Accessible Exposed Sink and Lavatory Trim:

1. All exposed sink and lavatory traps, piping and angle stops installed at accessible sink and lavatory locations shall include offset style drain tailpiece, p-trap installed near and parallel with back wall, and insulation kit specially manufactured for this installation. Armaflex with duct tape is not acceptable.

F. ADA Accessible Water Closet Requirements:

1. Handicapped accessible water closet flush valve handles shall face the center of the stall.
2. Coordinate flush valves in handicap accessible locations with grab bars installed by the General Contractor. Make modifications as necessary to flush valve piping to avoid conflict with grab bars. Common solutions include shortened or offset vacuum breaker tailpieces.

G. Bathtubs and Shower Requirements:

1. All acrylic and fiberglass bathtubs and showers shall have a non-shrink grout or manufacturer-approved material installed between the finished floor and floor of the fixture to prevent damage caused by deflection.
2. All rough-in pockets for showers and tubs located in basement floor installations shall be filled in with concrete and sealed tight.

3.2 ADJUSTING AND CLEANING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

B. At completion, clean plumbing fixtures, equipment, and faucet aerator screens.

3.3 FIXTURE ROUGH-IN SCHEDULE

A. Rough-in fixture piping connections in accordance with table on plumbing drawings of minimum sizes for particular fixtures.

END OF SECTION 22 40 00

SECTION 23 05 00 - BASIC HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements applicable to all Division 23 Sections. Also refer to Division 01 - General Requirements.

B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

1.2 SCOPE OF WORK

A. This Specification and the associated drawings govern the furnishing, installing, testing and placing into satisfactory operation the Mechanical Systems.

B. Each Contractor shall provide all new materials indicated on the drawings and/or in these specifications, and all items required to make the portion of the Mechanical Work a finished and working system.

C. Separate contracts will be awarded for the following work:

D. All work will be awarded under a single General Contract. The division of work listed below is for the Contractor's convenience and lists normal breakdown of the work.

E. Separate contracts will be awarded for the following work. The division of work listed below is for the contractors' convenience and lists a normal breakdown of the work. Please refer to the Construction Manager's scope statements for complete scope of work description.

F. Scope of Work:

1. Plumbing Work: Refer to Section 22 05 00 "Basic Plumbing Requirements".
2. Heating Work shall include, but is not necessarily limited to:

    a. Furnish and install complete gas piping system including all meter requirements.
    b. Furnish and install complete condenser water system including pumps, piping, insulation, and specialties.
    c. Furnish and install refrigerant piping, accessories, and final charge of refrigerant.
    d. Furnish and install condensate drain piping from cooling related equipment such as air handlers and cooling coil drain pans.
    e. Furnish and install seismic restraint and equipment designed for use in seismic conditions described in Section 23 05 50.
    f. Furnish and install firestopping systems for penetrations of fire-rated construction associated with this Contractor's work.

3. Air Conditioning and Ventilating Work shall include, but is not necessarily limited to:

    a. Furnish and install package rooftop air handling units complete with curbs.
    b. Furnish and install air-cooled condensing units and curbs.
    c. Furnish and install complete supply air ductwork systems including all fittings, insulation, and outlets.
    d. Furnish and install complete return air ductwork systems including all fittings, insulation, and inlets.
    e. Furnish and install all terminal air boxes and reheat coils.
    f. Furnish and install combustion air louver, damper, and ductwork.
    g. Furnish and install complete exhaust ductwork systems including all fittings, insulation, inlets, and fans.
    h. Furnish and install mechanical room ventilation systems including louvers, ductwork, insulation, and fans.
    i. Furnish and install gas flues, stacks, and breechings.
    j. Furnish and install all temperature control systems.
    k. Furnish and install all fire dampers.
    l. Furnish and install seismic restraint and equipment designed for use in seismic conditions described in Section 23 05 50.
    m. Furnish and install firestopping systems for penetrations of fire-rated construction associated with this Contractor's work.

4. Temperature Control Work shall include, but is not necessarily limited to:

    a. Furnish and install a complete temperature control system as specified in Section 23 09 00.
    b. Temperature control system shall consist of a full Direct Digital Control (DDC) system including all accessories, sensors, and programming.
    c. Furnish automatic control valves and dampers for installation by others.
    d. Furnish and install seismic restraint and equipment designed for use in seismic conditions described in Section 23 05 50.
    e. Furnish and install firestopping systems for penetrations of fire-rated construction associated with this Contractor's work.
    f. The temperature controls will be provided by the Owner, separate from this work. This Contractor shall install all devices so noted in Section 23 09 00.

5. Fire Protection Work: Refer to Section 21 05 00 "Basic Fire Suppression Requirements".
6. Testing, Adjusting, and Balancing Work shall include, but is not necessarily limited to:

    a. Furnish complete testing, adjusting, and balancing as specified in Section 23 05 93, including, but not limited to, air systems, hydronic systems, plumbing systems, and verification of control systems.

1.3 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL & CONTROL CONTRACTORS

A. Definitions:

1. "Mechanical Contractors" refers to the following:

    a. Plumbing Contractor.
    b. Heating Contractor.
    c. Air Conditioning and Ventilating Contractor.
    d. Temperature Control Contractor.
    e. Fire Protection Contractor.
    f. Testing, Adjusting, and Balancing Contractor.

2. Motor Control Wiring: The wiring associated with the remote operation of the magnetic coils of magnetic motor starters or relays, or the wiring that permits direct cycling of motors by means of devices in series with the motor power wiring. In the latter case the devices are usually single phase and are usually connected to the motor power wiring through a manual motor starter having "Manual-Off-Auto" provisions.
3. Control devices such as start-stop push buttons, thermostats, pressure switches, flow switches, relays, etc., generally represent the types of equipment associated with motor control wiring.
4. Motor control wiring is single phase and usually 120 volts. In some instances, the voltage will be the same as the motor power wiring. Generally, where the motor power wiring exceeds 120 volts, a control transformer is used to give a control voltage of 120 volts.
5. Temperature Control Wiring: The wiring associated with the operation of a motorized damper, solenoid valve or motorized valve, etc., either modulating or two-position, as opposed to wiring which directly powers or controls a motor used to drive equipment such as fans, pumps, etc.

    a. This wiring will be from a 120 volt source and may continue as 120 volt, or be reduced in voltage (24 volt) in which case a control transformer shall be furnished as part of the temperature control wiring.

6. Control Motor: An electric device used to operate dampers, valves, etc. It may be two-position or modulating. Conventional characteristics of such a motor are 24 volts, 60 cycles, 1 phase, although other voltages may be encountered.
7. Voltage is generally specified and scheduled as distribution voltage. Motor submittals may be based on utilization voltage if it corresponds to the correct distribution voltage.

Distribution/Nominal Voltage	Utilization Voltage
120	115
208	200
240	230
277	265
480	460

B. General:

1. The purpose of these Specifications is to outline the Electrical and Mechanical Contractor's responsibilities related to electrical work required for items such as temperature controls, mechanical equipment, fans, chillers, compressors and the like. The exact wiring requirements for much of the equipment cannot be determined until the systems have been selected and submittals reviewed. Therefore, the electrical drawings show only known wiring related to such items. All wiring not shown on the electrical drawings, but required for mechanical systems, is the responsibility of the Mechanical Contractor.
2. Where the drawings require the Electrical Contractor to wire between equipment furnished by the Mechanical Contractor, such wiring shall terminate at terminals provided in the equipment. The Mechanical Contractor shall provide complete electrical power/controls wiring diagrams and supervision to the Electrical Contractor and designate the terminal numbers for correct wiring.
3. All electrical work shall conform to the National Electrical Code. All provisions of the Electrical Specifications concerning wiring, protection, etc., apply to wiring provided by the Mechanical Contractor unless noted otherwise.
4. Control low (24V) and control line (120V) voltage wiring, conduit, and related switches and relays required for the automatic control and/or interlock of motors and equipment, including final connection, are to be furnished and installed under Divisions 21, 22 and 23. Materials and installation to conform to Class 1 or 2 requirements.
5. All Contractors shall establish utility elevations prior to fabrication and shall coordinate their material and equipment with other trades. When a conflict arises, priority is as follows:

    a. Light fixtures.
    b. Gravity flow piping, including steam and condensate.
    c. Electrical busduct.
    d. Sheet metal.
    e. Electrical cable trays, including access space.
    f. Sprinkler piping and other piping.
    g. Electrical conduits and wireway.

C. Mechanical Contractor's Responsibility:

1. Assumes responsibility for internal wiring of all equipment provided by the Mechanical Contractor, for example:

    a. Boiler Feed Pumps.
    b. Burners.
    c. Chillers.
    d. Computer Room Air Conditioning Units.
    e. Condensate Return Stations.
    f. Condensing Units.
    g. Makeup Air Units.
    h. Electric Humidifiers.
    i. Gas Trains.
    j. Package Air Handling Units.
    k. Packaged Rooftop Units.

2. Assumes all responsibility for the Temperature Control wiring, when the Temperature Control Contractor is a Subcontractor to the Mechanical Contractor.
3. Shall verify all existing equipment sizes and capacities where units are to be modified, moved or replaced. Contractor shall notify Architect/Engineer of any discrepancies prior to ordering new units or replacement parts, including replacements of equipment motors.
4. Temperature Control Subcontractor's Responsibility:

    a. Wiring of all devices needed to make the Temperature Control System functional.
    b. Verifying any control wiring on the electrical drawings as being by the Electrical Contractor. All wiring required for the Control System, but not shown on the electrical drawings, is the responsibility of the Temperature Control Subcontractor.
    c. Coordinating equipment locations (such as relays, transformers, etc.) with the Electrical Contractor, where wiring of the equipment is by the Electrical Contractor.

5. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

D. Electrical Contractor's Responsibility:

1. Provides all combination starters, manual starters and disconnect devices shown on the Electrical Drawings or indicated to be by the Electrical Contractor on the Mechanical Drawings or Specifications.
2. Installs and wires all remote control devices furnished by the Mechanical Contractor or Temperature Control Subcontractor when so noted on the Electrical Drawings.
3. Provides motor control and temperature control wiring, where so noted on the drawings.
4. Coordinate with the Mechanical Contractor for size of motors and/or other electrical devices involved with repair or replacement of existing equipment.
5. Furnishes, installs and connects all relays, etc., for automatic shutdown of certain fans upon actuation of the Fire Alarm System as indicated and specified in Division 28.
6. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

1.4 COORDINATION DRAWINGS

A. Definitions:

1. Coordination Drawings: A compilation of the pertinent layout and system drawings that show the sizes and locations, including elevations, of system components and required access areas to ensure that no two objects will occupy the same space.

a. Mechanical trades shall include, but are not limited to, mechanical equipment, ductwork, fire protection systems, plumbing piping, medical gas systems, hydronic piping, steam and steam condensate piping, and any item that may impact coordination with other disciplines.
b. Electrical trades shall include, but are not limited to, electrical equipment, conduit 1.5" (40 mm) and larger, conduit racks, cable trays, pull boxes, transformers, raceway, busway, lighting, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
c. Technology trades shall include, but are not limited to, technology equipment, racks, conduit 1.5" (40 mm) and larger, conduit racks, cable trays, ladder rack, pull boxes, raceway, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
d. Maintenance clearances and code-required dedicated space shall be included.
e. The coordination drawings shall include all underground, underfloor, in-floor, in chase, and vertical trade items.

2. Spaces with open/cloud ceiling architecture shall indicate the overhead utilities and locate equipment as required to maintain clearance above lights. The intent for the installation is to maintain a maximum allowable vertical clearance and an organized/clean manner in the horizontal. Notify Architect/Engineer of the maximum clearance which can be maintained. Failure to comply will result in modifications with no cost to Owner.

    a. In cloud ceiling architecture, when open cabling/wire and/or cable tray crosses gaps between ceiling clouds and/or walls, cabling is to transition to conduits to span the gaps in order to conceal cabling from below.

3. The contractors shall use the coordination process to identify the proper sequence of installation of all utilities above ceilings and in other congested areas, to ensure an orderly and coordinated end result, and to provide adequate access for service and maintenance.

B. Participation:

1. The contractors and subcontractors responsible for work defined above shall participate in the coordination drawing process.
2. One contractor shall be designated as the Coordinating Contractor for purposes of preparing a complete set of composite electronic CAD coordination drawings that include all applicable trades, and for coordinating the activities related to this process. The Coordinating Contractor for this project shall be the Mechanical Contractor.

    a. The Coordinating Contractor shall utilize personnel familiar with requirements of this project and skilled as draftspersons/CAD operators, competent to prepare the required coordination drawings.

3. Electronic CAD drawings shall be submitted to the Coordinating Contractor for addition of work by other trades. IMEG will provide electronic file copies of applicable drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by IMEG. IMEG will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings.

C. Drawing Requirements:

1. The file format and file naming convention shall be coordinated with and agreed to by all contractors participating in the coordination process and the Owner.

    a. Scale of drawings:

        1) General plans: 1/4 Inch = 1'-0" (minimum).
        2) Mechanical, electrical, communication rooms, and including the surrounding areas within 10 feet: 1/2 Inch = 1'-0" (minimum).
        3) Shafts and risers: 1/2 Inch = 1'-0" (minimum).
        4) Sections of shafts and mechanical and electrical equipment rooms: 1/4 Inch = 1'-0" (minimum).
        5) Sections of congested areas: 1/2 Inch = 1'-0" (minimum).

2. Ductwork layout drawings shall be the baseline system for other components. Ductwork layout drawings shall be modified to accommodate other components as the coordination process progresses.
3. There may be more drawings required for risers, top and bottom levels of mechanical rooms, and shafts.
4. The minimum quantity of drawings will be established at the first coordination meeting and sent to the A/E for review. Additional drawings may be required if other areas of congestion are discovered during the coordination process.

D. General:

1. Coordination drawing files shall be made available to the A/E and Owner's Representative. The A/E will only review identified conflicts and give an opinion but will not perform as a coordinator.
2. A plotted set of coordination drawings shall be available at the project site.
3. Coordination drawings are not shop drawings and shall not be submitted as such.
4. The contract drawings are schematic in nature and do not show every fitting and appurtenance for each utility. Each contractor is expected to have included in the bid sufficient fittings, material, and labor to allow for adjustments in routing of utilities made necessary by the coordination process and to provide a complete and functional system.
5. The contractors will not be allowed additional costs or time extensions due to participation in the coordination process.
6. The contractors will not be allowed additional costs or time extensions for additional fittings, reroutings or changes of duct size, that are essentially equivalent sizes to those shown on the drawings and determined necessary through the coordination process.

7. The A/E reserves the right to determine space priority of equipment in the event of spatial conflicts or interference between equipment, piping, conduit, ducts, and equipment provided by the trades.
8. Changes to the contract documents that are necessary for systems installation and coordination shall be brought to the attention of the A/E.
9. Access panels shall preferably occur only in gypsum board walls or plaster ceilings where indicated on the drawings.

    a. Access to mechanical, electrical, technology, and other items located above the ceiling shall be through accessible lay-in ceiling tile areas.
    b. Potential layout changes shall be made to avoid additional access panels.
    c. Additional access panels shall not be allowed without written approval from the A/E at the coordination drawing stage.
    d. Providing additional access panels shall be considered after other alternatives are reviewed and discarded by the A/E and the Owner's Representative.
    e. When additional access panels are required, they shall be provided without additional cost to the Owner.

10. Complete the coordination drawing process and obtain sign off of the drawings by all contractors prior to installing any of the components.
11. Conflicts that result after the coordination drawings are signed off shall be the responsibility of the contractor or subcontractor who did not properly identify their work requirements, or installed their work without proper coordination.
12. Updated coordination drawings that reflect as-built conditions may be used as record documents.

1.5 QUALITY ASSURANCE

A. Contractor's Responsibility Prior to Submitting Pricing Data:

1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guidelines, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Design Team any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Design Team will be done at the Contractor's risk.

B. Qualifications:

1. Only products of reputable manufacturers are acceptable.

2. All Contractors and subcontractors shall employ only workers skilled in their trades.

C. Compliance with Codes, Laws, Ordinances:

1. Conform to all requirements of the Caseyville, Illinois Codes, Laws, Ordinances and other regulations having jurisdiction.
2. Conform to all State Codes.
3. If there is a discrepancy between the codes and regulations and these specifications, the Architect/Engineer shall determine the method or equipment used.
4. If the Contractor notes, at the time of bidding, that any parts of the drawings or specifications do not comply with the codes or regulations, Contractor shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, Contractor shall submit with the proposal a separate price to make the system comply with the codes and regulations.
5. All changes to the system made after letting of the contract, to comply with codes or requirements of Inspectors, shall be made by the Contractor without cost to the Owner.
6. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.
7. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.

D. Permits, Fees, Taxes, Inspections:

1. Procure all applicable permits and licenses.
2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
3. Pay all charges for permits or licenses.
4. Pay all fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
5. Pay all charges arising out of required inspections by an authorized body.
6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
7. Where applicable, all fixtures, equipment and materials shall be approved or listed by Underwriter's Laboratories, Inc.

E. Utility Company Requirements:

1. Secure from the appropriate private or public utility company all applicable requirements.
2. Comply with all utility company requirements.
3. Make application for and pay for service connections, such as gas.
4. Make application for and pay for all meters and metering systems required by the utility company.

F. Examination of Drawings:

1. The drawings for the mechanical work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of pipes and ducts to best fit the layout of the job.
3. Scaling of the drawings is not sufficient or accurate for determining these locations.
4. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
5. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
6. If an item is either on the drawings or in the specifications, it shall be included in this contract.
7. Determination of quantities of material and equipment required shall be made by the Contractor from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater number shall govern.
8. Where used in mechanical documents, the word "furnish" shall mean supply for use, the word "install" shall mean connect complete and ready for operation, and the word "provide" shall mean to supply for use and connect complete and ready for operation.

    a. Any item listed as furnished shall also be installed, unless otherwise noted.
    b. Any item listed as installed shall also be furnished, unless otherwise noted.

G. Field Measurements:

1. Verify all pertinent dimensions at the job site before ordering any materials or fabricating any supports, pipes or ducts.

H. Electronic Media/Files:

1. Construction drawings for this project have been prepared utilizing Revit.
2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by IMEG.
4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.
5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
6. The drawings prepared by IMEG for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.

7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.
8. The information is provided to expedite the project and assist the Contractor with no guarantee by IMEG as to the accuracy or correctness of the information provided. IMEG accepts no responsibility or liability for the Contractor's use of these documents.

1.6 SUBMITTALS

A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

1. Submittals List:

Referenced Specification Section	Submittal Item
23 05 00	Owner Training Agenda
23 05 13	Motors
23 05 29	Hangers and Supports
23 05 29	Prefabricated Curbs
23 05 48	Vibration Isolation Equipment
23 05 50	Seismic Restraint Systems
23 05 53	HVAC Identification
23 05 93	Testing, Adjusting, and Balancing
23 07 13	Duct Insulation
23 09 13	Instrumentation
23 31 00	Ductwork
23 31 00	Ductwork Layout Drawings
23 31 00	Duct Specialties (such as Turning Vanes)
23 33 00	Duct Silencers
23 33 00	Air Blenders
23 33 00	Fire Dampers
23 33 00	Smoke Dampers
23 33 00	Combination Fire Smoke Dampers
23 34 16	Centrifugal Fans
23 34 23	Power Ventilators
23 36 00	Terminal Air Boxes
23 37 00	Grilles, Registers, and Diffusers
23 37 00	Louvers
23 74 16.12	Packaged Rooftop Air Conditioning Units - 25T and Below
23 81 26	Split System Air Conditioning Units

B. General Submittal Procedures: In addition to the provisions of Division 01, the following are required:

1. Transmittal: Each transmittal shall include the following:

a. Date
b. Project title and number
c. Contractor's name and address
d. Division of work (e.g., plumbing, heating, ventilating, etc.)
e. Description of items submitted and relevant specification number
f. Notations of deviations from the contract documents
g. Other pertinent data

2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:

a. Date
b. Project title and number
c. Architect/Engineer
d. Contractor and subcontractors' names and addresses
e. Supplier and manufacturer's names and addresses
f. Division of work (e.g., plumbing, heating, ventilating, etc.)
g. Description of item submitted (using project nomenclature) and relevant specification number
h. Notations of deviations from the contract documents
i. Other pertinent data
j. Provide space for Contractor's review stamps

3. Composition:

a. Submittals shall be submitted using specification sections and the project nomenclature for each item.
b. Individual submittal packages shall be prepared for items in each specification section. All items within a single specification section shall be packaged together where possible. An individual submittal may contain items from multiple specifications sections if the items are intimately linked (e.g., pumps and motors).
c. All sets shall contain an index of the items enclosed with a general topic description on the cover.

4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; electrical power criteria (e.g., voltage, phase, amps, horsepower, kW, etc.) wiring and control diagrams; Short Circuit Current Rating (SCCR); dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
5. Contractor's Approval Stamp:

a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
b. Unstamped submittals will be rejected.

c. The Contractor's review shall include, but not be limited to, verification of the following:

1) Only approved manufacturers are used.
2) Addenda items have been incorporated.
3) Catalog numbers and options match those specified.
4) Performance data matches that specified.
5) Electrical characteristics and loads match those specified.
6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
7) Dimensions and service clearances are suitable for the intended location.
8) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
9) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).

d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.
e. The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.

6. Submittal Identification and Markings:

a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
b. The Contractor shall clearly indicate the size, finish, material, etc.
c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
d. All marks and identifications on the submittals shall be unambiguous.

7. Schedule submittals to expedite the project. Coordinate submission of related items.
8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.
9. Reproduction of contract documents alone is not acceptable for submittals.
10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Architect/Engineer.
11. Submittals not required by the contract documents may be returned without review.
12. The Architect/Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Architect/Engineer to recheck and handle the additional shop drawing submittals.

13. Submittals shall be reviewed and approved by the Architect/Engineer before releasing any equipment for manufacture or shipment.
14. Contractor's responsibility for errors, omissions. or deviation from the contract documents in submittals is not relieved by the Architect/Engineer's approval.
15. Schedule shall allow for adequate time to perform orderly and proper review of submittals, including time for consultants and Owner if required, and resubmittals by Contractor if necessary, and to cause no delay in Work or in activities of Owner or other contractors.

    a. Allow at least two weeks for Architect's/Engineer's review and processing of each submittal.

16. Architect/Engineer reserves the right to withhold action on a submittal which, in the Architect/Engineer's opinion, requires coordination with other submittals until related submittals are received. The Architect/Engineer will notify the Contractor, in writing, when they exercise this right.

C. Electronic Submittal Procedures:

1. Distribution: Email submittals as attachments to all parties designated by the Architect/Engineer, unless a web-based submittal program is used.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. Submittal file name: 23 XX XX.description.YYYYMMDD
    b. Transmittal file name: 23 XX XX.description.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.

1.7 SCHEDULE OF VALUES

A. The requirements herein are in addition to the provisions of Division 01.

B. Format:

1. Use AIA Document Continuation Sheets G703 or another similar form approved by the Owner and Architect/Engineer.
2. Submit in Excel format.
3. Support values given with substantiating data.

C. Preparation:

1. Itemize work required by each specification section and list all providers. All work provided by subcontractors and major suppliers shall be listed on the Schedule of Values. List each subcontractor and supplier by company name.
2. Break down all costs into:

    a. Material: Delivered cost of product with taxes paid.
    b. Labor: Labor cost, excluding overhead and profit.

3. Itemize the cost for each of the following:

    a. Overhead and profit.
    b. Bonds.
    c. Insurance.
    d. General Requirements: Itemize all requirements.

4. For each line item having an installed cost of more than $5,000, break down costs to list major products or operations under each item. At a minimum, provide material and labor cost line items for the following:

    a. Each piece of equipment requiring shop drawings (e.g., each air handling unit, pump, exhaust fan, etc.). Use the equipment nomenclature (AHU-1, P-1, EF-1, etc.) on the Schedule of Values.
    b. Each type of small unitary equipment (e.g., FCUs, UHs, CABs, etc.). Multiple units of the same type can be listed together, provided quantities are also listed so unit costs can be determined.
    c. Each piping system (chilled water, heating water, steam, condensate, etc.). In addition, for larger projects, break down the material and labor for each piping system based on geography (building, floor, and/or wing).
    d. Each duct system (supply, return, relief, outside air, etc.) listed separately for each unit they serve (AHU-1 supply air ductwork, AHU-1 return air ductwork, etc.).
    e. Pipe insulation with separate material and labor line items for each piping system listed above.
    f. Duct insulation with separate material and labor line items for each duct system listed above.
    g. Temperature controls broken down into material and labor for the following:

        1) Engineering
        2) Controllers, devices, sensors, etc.
        3) Control valves
        4) Control dampers
        5) Conduit
        6) Wiring
        7) Programming
        8) Commissioning

    h. Site utilities (5' beyond building)
    i. Seismic design
    j. Air balancing

k. Water balancing
l. Commissioning
m. Record drawings
n. Punchlist and closeout

D. Update Schedule of Values when:

1. Indicated by Architect/Engineer.
2. Change of subcontractor or supplier occurs.
3. Change of product or equipment occurs.

1.8 CHANGE ORDERS

A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders shall be broken down by sheet or associated individual line item indicated in the change associated narrative, whichever provides the most detailed breakdown. Change orders with inadequate breakdown will be rejected.

B. Itemized pricing with unit cost shall be provided from all distributors and associated subcontractors.

C. Change order work shall not proceed until authorized.

1.9 EQUIPMENT SUPPLIERS' INSPECTION

A. The following equipment shall not be placed in operation until a competent installation and service representative of the manufacturer has inspected the installation and certified that the equipment is properly installed, adjusted and lubricated; that preliminary operating instructions have been given; and that the equipment is ready for operation:

1. Condensing Units
2. Fire Seal Systems
3. Seismic Restraints and Equipment Bracing
4. In-Line Pumps

B. Contractor shall arrange for and obtain supplier's on-site inspection(s) at proper time(s) to assure each phase of equipment installation and/or connection is in accordance with the manufacturer's instructions.

C. Submit copies of start-up reports to the Architect/Engineer and include copies of Owner's Operation and Maintenance Manuals.

1.10 PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE

A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage. Keep materials clean, dry and free from harmful conditions. Immediately remove any materials that become wet or that are suspected of becoming contaminated with mold or other organisms.

B. Keep all bearings properly lubricated and all belts properly tensioned and aligned.

C. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Mechanical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.

D. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate the work with other trades.

1.11 NETWORK / INTERNET CONNECTED EQUIPMENT

A. These specifications may require certain equipment or systems to have network, Internet and/or remote access capability ("Network Capability"). Any requirement for Network Capability shall be interpreted only as a functional capability and is not to be construed as authority to connect or enable any Network Capability. Network Capability may only be connected or enabled with the express written consent of the Owner.

1.12 WARRANTY

A. Provide one-year warranty, unless otherwise noted, to the Owner for all fixtures, equipment, materials, and workmanship.

B. The warranty period for all work in this Division of the specifications shall commence on the date of final acceptance, unless a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.

C. Warranty requirements shall extend to correction, without cost to the Owner, of all Work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage resulting from defects or nonconformance with contract documents.

1.13 INSURANCE

A. Contractor shall maintain insurance coverage as set forth in Division 0 of these specifications.

1.14 MATERIAL SUBSTITUTION

A. Where several manufacturers' names are given, the scheduled manufacturer is the basis for job design and establishes the quality required.

B. Equivalent equipment manufactured by the other listed manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications and fits in the allocated space. When using other listed manufacturers, the Contractor shall assume responsibility for any and all modifications necessary (including, but not limited to structural supports, electrical connections, piping and ductwork connections and arrangement, plumbing connections and rough-in, and regulatory agency approval, etc.) and coordinate such with other contractors.

C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer not later than ten days prior to the bid opening.

D. This Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on the Contractors part or on the part of other Contractors whose work is affected.

E. This Contractor may list voluntary add or deduct prices for alternate materials on the bid form. These items will not be used in determining the low bidder.

F. All material substitutions requested later than ten (10) days prior to bid opening must be listed as voluntary changes on the bid form.

1.15 PROJECT COMMISSIONING

A. The Contractor shall work with the Commissioning Agent (CxA) as described in Section 01 91 00 and provide all services as described in the Commissioning Plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 JOBSITE SAFETY

A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or the employees and subconsultants at a construction site, shall relieve the Contractor and other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.2 EXCAVATION, FILL, BACKFILL, COMPACTION

A. General:

1. Prior to the commencement of any excavation or digging, the Contractor shall verify all underground utilities with the regional utility locator. Provide prior notice to the locator before excavations. Contact information for most regional utility locaters can be found at the following website (https://call811.com/) or by calling 811.
2. The Contractor shall do all excavating, filling, backfilling and compacting associated with the work.

B. Excavation:

1. Make all excavations to accurate, solid, undisturbed earth, and to proper dimensions.
2. Where excavations are made in error below foundations, concrete of same strength as specified for the foundations or thoroughly compacted sand-gravel fill, as determined by the Architect/Engineer, shall be placed in such excess excavations. Place thoroughly compacted, clean, stable fill in excess excavations under slabs on grade, at the Contractor's expense.
3. Trim bottom and sides of excavations to grades required for foundations.
4. Protect excavations against frost and freezing.
5. Take care in excavating not to damage surrounding structures, equipment, or buried pipe. Do not undermine footing or foundation.
6. Perform all trenching in a manner to prevent cave-ins and risk to workers.
7. Where original surface is pavement or concrete, the surface shall be saw cut to provide clean edges and assist in the surface restoration.
8. Where satisfactory bearing soil for foundations is not found at the indicated levels, the Architect/Engineer or their representative shall be notified immediately, and no further work shall be done until further instructions are given by the Architect/Engineer or their representative.

C. Dewatering:

1. Contractor shall furnish, install, operate, and remove all dewatering pumps and pipes needed to keep trenches and pits free of water.

D. Underground Obstructions:

1. Known underground piping, foundations, and other obstructions in the vicinity of construction are shown on the drawings. Use great care in making installations near underground obstruction.
2. If objects not shown on the drawings are encountered, remove, relocate, or perform extra work as directed by the Architect/Engineer.

E. Fill and Backfilling:

1. Utilities Bedding: Lay underground utilities on minimum of 6"sand bedding or CA6 crushed stone. Compact bedding under utilities smooth, with no sharp edges protruding, to protect the utilities from puncture. Shape bedding to provide continuous support for bells, joints, and barrels of utilities and for joints and fittings.
2. Envelope around utilities to 6" above utilities: Place and compact sand or CA6 to a height of 6" over utilities in 6" layers. Each layer shall be placed, then carefully and uniformly tamped, to eliminate lateral or vertical displacement. After connection joints are made, any misalignment can be corrected by tamping backfill around the utilities.
3. Backfill from 6" above utilities to earthen grade: Place all backfill materials above the utilities in uniform layers not exceeding 6" deep. Each layer shall be placed, then carefully and uniformly tamped, to eliminate lateral or vertical displacement.
4. Backfill from 6" above utilities to below slabs or paved area: Where the fill and backfill will ultimately be under a building, floor or paving, each layer of backfill materials shall be compacted to 95% of the maximum density determined by AASHTO Designation T 99 or ASTM Designation D 698. Moisture content of soil at time of compaction shall not exceed plus or minus 2% of optimum moisture content determined by AASHTO T 99 or ASTM D 698 test.
5. Backfill Materials: Native soil materials may be used as backfill if approved by the Geotechnical Engineer. Backfill material shall be free of rock or gravel larger than 3" in any dimension and shall be free of debris, waste, frozen materials, vegetation, high void content, and other deleterious materials. Water shall not be permitted to rise in unbackfilled trenches.
6. Dispose of excess excavated earth as directed.
7. Backfill all trenches and excavations immediately after installing utilities or removal of forms, unless other protection is provided.
8. Around piers and isolated foundations and structures, backfill and fill shall be placed and consolidated simultaneously on all sides to prevent wedge action and displacement. Fill and backfill materials shall be spread in 6 inch uniform horizontal layers with each layer compacted separately to required density.

F. Surface Restoration:

1. Where trenches are cut through existing graded, planted, or landscaped areas, the areas shall be restored to the original condition. Replace all planting removed or damaged to its original condition. A minimum of 6 inches of topsoil shall be applied where disturbed areas are to be seeded or sodded.
2. Concrete or asphalt type pavement, seal coat, rock, gravel or earth surfaces removed or damaged shall be replaced with comparable materials and restored to original condition.

3.3 ARCHITECT/ENGINEER OBSERVATION OF WORK

A. The Contractor shall provide seven (7) calendar days' notice to the Architect/Engineer prior to:

1. Placing fill over underground and underslab utilities.
2. Covering exterior walls, interior partitions and chases.
3. Installing hard or suspended ceilings and soffits.

B. The Architect/Engineer will have the opportunity to review the installation and provide a written report noting deficiencies requiring correction. The Contractor's schedule shall account for these reviews and show them as line items in the approved schedule.

C. Above-Ceiling Final Observation

1. All work above the ceilings must be complete prior to the Architect/Engineer's review. This includes, but is not limited to:

   a. Pipe insulation is installed and fully sealed.
   b. Pipe and duct wall penetrations are sealed.
   c. Pipe identification and valve tags are installed.
   d. Main, branch and flexible ducts are installed.
   e. Diffusers, registers and grilles are installed and connected to ductwork.
   f. Terminal air box reheat coil piping or wiring is complete.
   g. Terminal air box control wiring is complete and all control boxes are closed.

2. In order to prevent the Above-Ceiling Final Observation from occurring too early, the Contractor shall review the status of the work and certify, in writing, that the work is ready for the Above-Ceiling Final Observation.
3. It is understood that if the Architect/Engineer finds the ceilings have been installed prior to this review and prior to 7 days elapsing, the Architect/Engineer may not recommend further payments to the contractor until such time as full access has been provided.

3.4 PROJECT CLOSEOUT

A. The following paragraphs supplement the requirements of Division 01.

B. IDPH Final Occupancy Checklist for Request of Inspection:

1. Each Contractor must submit all forms and certifications required by IDPH relating to their work at 85% completion of the project or when directed by the Owner/Architect/Engineer.

C. Final Jobsite Observation:

1. In order to prevent the Final Jobsite Observation from occurring too early, the Contractor is required to review the completion status of the project and certify that the job is ready for the final jobsite observation.
2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review.
3. Upon Contractor certification that the project is complete and ready for a final observation, the Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.
4. It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineer's additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

D. Before final payment is authorized, this Contractor must submit the following:

1. Operation and maintenance manuals with copies of approved shop drawings.
2. Record documents including marked-up or reproducible drawings and specifications.
3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of This Contractor and shall be signed by the Owner's representatives.
4. Inspection by State Boiler Inspector.
5. Start-up reports on all equipment requiring a factory installation inspection or start-up.
6. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site and place in location as directed; receipt by Architect/Engineer required prior to final payment approval.

3.5 OPERATION AND MAINTENANCE MANUALS

A. General:

1. Provide an electronic copy of the O&M manuals as described below for Architect/Engineer's review and approval. The electronic copy shall be corrected as required to address the Architect/Engineer's comments. Once corrected, electronic copies and paper copies shall be distributed as directed by the Architect/Engineer.
2. Approved O&M manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.

B. Electronic Submittal Procedures:

1. Distribution: Email the O&M manual as attachments to all parties designated by the Architect/Engineer.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. O&M file name: O&M.div23.contractor.YYYYMMDD
    b. Transmittal file name: O&Mtransmittal.div23.contractor.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.

6. Provide the Owner with an approved copy of the O&M manual on compact discs (CD), digital video discs (DVD), or flash drives with a permanently affixed label, printed with the title "Operation and Maintenance Instructions", title of the project and subject matter of disc/flash drive when multiple disc/flash drives are required.
7. All text shall be searchable.
8. Bookmarks shall be used, dividing information first by specification section, then systems, major equipment and finally individual items. All bookmark titles shall include the nomenclature used in the construction documents and shall be an active link to the first page of the section being referenced.

C. Operation and Maintenance Instructions shall include:

1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all subcontractors, and major equipment suppliers, with addresses, telephone numbers, website addresses, email addresses and point of contacts. Website URLs and email addresses shall be active links in the electronic submittal.
2. Table of Contents: Include a table of contents describing specification section, systems, major equipment, and individual items.
3. Copies of all final approved shop drawings and submittals. Include Architect's/Engineer's shop drawing review comments. Insert the individual shop drawing directly after the Operation and Maintenance information for the item(s) in the review form.
4. Refer to Section 23 09 00 for additional requirements for Temperature Control submittals.
5. Copy of final approved test and balance reports.
6. Copies of all factory inspections and/or equipment startup reports.
7. Copies of warranties.
8. Schematic electrical power/controls wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
9. Dimensional drawings of equipment.
10. Capacities and utility consumption of equipment.
11. Detailed parts lists with lists of suppliers.
12. Operating procedures for each system.
13. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
14. Repair procedures for major components.
15. List of lubricants in all equipment and recommended frequency of lubrication.
16. Instruction books, cards, and manuals furnished with the equipment.

3.6 INSTRUCTING THE OWNER'S REPRESENTATIVES

A. Adequately instruct the Owner's designated representatives in the maintenance, care, and operation of all systems installed under this contract.

B. Provide verbal and written instructions to the Owner's representatives by FACTORY PERSONNEL in the care, maintenance, and operation of the equipment and systems.

C. Contractor shall make a DVD video recording of instructions to the Owner while explaining the system so additional personnel may view the instructions at a later date. The video recording shall be the property of the Owner.

D. The Owner has the option to make a video recording of all instructions. Coordinate schedule of instructions to facilitate this recording.

E. The instructions shall include:

1. Explanation of all system flow diagrams.
2. Explanation of all air handling systems.
3. Temperature control system operation including calibration, adjustment and proper operating conditions of all sensors.
4. Maintenance of equipment.
5. Smoke control systems.
6. Stairwell pressurization systems.
7. Start-up procedures for all major equipment.
8. Explanation of seasonal system changes.
9. Description of emergency system operation.

F. Notify the Architect/Engineer of the time and place for the verbal instructions to be given to the Owner's representative so a representative can attend if desired.

G. Minimum hours of instruction for each item shall be:

1. Refrigeration System - 4 hours.
2. Chemical Treatment System - As defined in Section 23 25 00.
3. Air Handling System(s) - 4 hours.
4. Exhaust System(s) - 4 hours.
5. Temperature Controls - As defined in Section 23 09 00.

H. The Contractor shall prepare a detailed, written training agenda and submit it to the Architect/Engineer a minimum of two weeks prior to the formal training for approval. The written agenda shall include specific training points within the items described above. For example: how to adjust setpoints, troubleshooting, proper start-up, proper shut-down, seasonal changes, draining, venting, changing filters, changing belts, etc. Failure to provide and follow an approved training agenda may result in additional training required at the expense of the Contractor.

I. Operating Instructions:

1. Contractor is responsible for all instructions to the Owner's representatives for the mechanical and control systems.
2. If the Contractor does not have staff that can adequately provide the required instructions the Contractor shall include in the bid an adequate amount to reimburse the Owner for the Architect/Engineer to perform these services.

3.7 SYSTEM STARTING AND ADJUSTING

A. The mechanical systems shall be complete and operating. System startup, testing, adjusting, and balancing to obtain satisfactory system performance is the responsibility of the Contractor. This includes calibration and adjustments of all controls, noise level adjustments and final comfort adjustments as required.

B. Complete all manufacturer-recommended startup procedures and checklists to verify proper motor rotation, electrical power voltage is within equipment limitations, equipment controls maintain pressures and temperatures within acceptable ranges, all filters and protective guards are in-place, acceptable access is provided for maintenance and servicing, and equipment operation does not pose a danger to personnel or property.

C. Operate all HVAC systems continuously for at least one week prior to occupancy to bring construction materials to suitable moisture levels. Areas with mechanical cooling shall be maintained below 60% RH.

D. Contractor shall adjust the mechanical systems and controls at season changes during the one year warranty period, as required, to provide satisfactory operation and to prove performance of all systems in all seasons.

E. All operating conditions and control sequences shall be tested during the start-up period. Test all interlocks, safety shutdowns, controls, and alarms.

F. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to ensure that all systems perform properly. If the Architect/Engineer is requested to visit the job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period, through no fault of the design; the Contractor shall reimburse the Owner on a time and materials basis for services rendered at the Architect/Engineer's standard hourly rates in effect when the services are requested. The Contractor shall pay the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

3.8 RECORD DOCUMENTS

A. The following paragraphs supplement Division 01 requirements.

B. Maintain at the job site a separate and complete set of mechanical drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.

C. Mark drawings to indicate revisions to piping and ductwork, size and location, both exterior and interior; including locations of coils, dampers, other control devices, filters, and other units requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned from column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (e.g., traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.

D. Refer to Section 23 09 00 for additional requirements for Temperature Control documents.

E. Before completion of the project, a set of reproducible mechanical drawings will be given to the Contractor for transfer of all as-built conditions from the paper set maintained at the job site. All marks on reproducibles shall be clear and permanent.

F. Mark specifications to show approved substitutions; Change Orders, and actual equipment and materials used.

G. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.

H. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

3.9 PAINTING

A. This Contractor shall paint the following items:

1. All piping in mechanical room
2. Piping exposed in kitchen

B. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available.

C. Equipment in finished areas that will be painted to match the room decor will be painted by others. Should this Contractor install equipment in a finished area after the area has been painted, the Contractor shall have the equipment and all its supports, hangers, etc., painted to match the room decor.

D. Equipment cabinets, casings, covers, metal jackets, etc., in equipment rooms or concealed spaces, shall be furnished in standard or prime finish, free from scratches, abrasions, chips, etc.

E. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with baked enamel finish coat free from scratches, abrasions, chips, etc. If color option is specified or is standard to the unit, this Contractor shall, before ordering, verify with the Architect/Engineer the color preference and furnish this color.

F. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, storage room, etc., furnished by this Contractor. Equipment furnished with a factory coat of paint and enamel need not be painted, provided the factory applied finish is not marred or spattered. If so, equipment shall be refinished with the same paint as was factory applied.

G. Paint all outdoor uninsulated steel piping the color selected by Owner or Architect/Engineer.

H. Paint all outdoor exposed natural gas piping the color selected by Owner or Architect/Engineer.

I. After surfaces have been thoroughly cleaned and are free of oil, dirt, and other foreign matter; paint all pipes and equipment with the following:

1. Bare Metal Surfaces - Apply one coat of primer suitable for the metal being painted. Finish with two coats of Alkyd base enamel paint.
2. Insulated Surfaces - Paint insulation jackets with two coats of semi-gloss acrylic latex paint.
3. Color of paint shall be as follows:

a. All piping in mechanical room:

1) Chilled Water: Blue pipe/black letters
2) Condenser Water: Green pipe/black letters
3) Heating Water: Orange pipe/black letters
4) Natural Gas: Yellow pipe/black letters

b. Piping exposed in kitchen:

1) All Piping: White

3.10 ADJUST AND CLEAN

A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project. Clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material from all equipment.

B. Clean all drain pans and areas where moisture is present. Immediately report any mold, biological growth, or water damage.

C. Remove all rust, scale, dirt, oils, stickers and thoroughly clean exterior of all exposed bare metal ductwork, piping, hangers, and accessories.

D. Remove all rubbish, debris, etc., accumulated during construction from the premises.

3.11 SPECIAL REQUIREMENTS

A. Contractor shall coordinate the installation of all equipment, valves, dampers, operators, etc., with other trades to maintain clear access area for servicing.

B. All equipment shall be installed in such a way to maximize access to parts needing service or maintenance. Review the final field location, placement, and orientation of equipment with the Owner's designated representative prior to setting equipment.

C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's designated representative will result in removal and reinstallation of the equipment at the Contractor's expense.

3.12 IAQ MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION

A. Contractors shall make all reasonable efforts to prevent construction activities from affecting the air quality of the occupied areas of the building or outdoor areas near the building. These measures shall include, but not be limited to:

1. All contractors shall endeavor to minimize the amount of contaminants generated during construction. Methods to be employed shall include, but not be limited to:

    a. Minimizing the amount of dust generated.
    b. Reducing solvent fumes and VOC emissions.
    c. Maintain good housekeeping practices, including sweeping and periodic dust and debris removal. There should be no visible haze in the air.
    d. Protect stored on-site and installed absorptive materials from moisture damage.

2. Request that the Owner designate an IAQ representative.
3. Review and receive approval from the Owner's IAQ representative for all IAQ-related construction activities and negative pressure containment plans.
4. Inform the IAQ representative of all conditions that could adversely impact IAQ, including operations that will produce higher than normal dust production or odors.
5. Schedule activities that may cause IAQ conditions that are not acceptable to the Owner's IAQ representative during unoccupied periods.
6. Request copies of and follow all of the Owner's IAQ and infection control policies.
7. Unless no other access is possible, the entrance to construction site shall not be through the existing facility.
8. To minimize growth of infectious organisms, do not permit damp areas in or near the construction area to remain for over 24 hours.
9. In addition to the criteria above, provide measures as recommended in the SMACNA "IAQ Guidelines for Occupied Buildings Under Construction".
10. If permanently installed air handlers are used to serve both construction and occupied areas, all return grilles throughout construction areas shall be sealed to prevent air from construction areas being supplied to occupied areas.
11. If permanently installed air handlers are used during construction to serve only construction areas and do not supply air to adjacent occupied areas, MERV 8 filtration media shall be used to protect each return air grille or opening. The intent of this will be to prevent construction dust and debris from entering any return or supply air ductwork in the facility. All filtration media shall be replaced immediately prior to occupancy.
12. Construction areas shall be maintained at a negative pressure at all times during construction. When areas are under construction, HEPA filtered exhaust fan(s) shall be installed in sufficient quantities as required to maintain construction areas at sufficient negative pressure as called for in the Owner's Infection Control Risk Assessment (ICRA). HEPA filtered exhaust fan discharge shall be ducted either outdoors or back into designated hospital areas as called for in the Owner's ICRA.
13. For each area under construction, the Contractor shall install a negative pressure indicator equivalent to Lamiflow Model L-102F as manufactured by Lamiflow Technologies. Contractor shall regularly monitor and record the negative pressure condition of the construction areas as called for in the Owner's ICRA.

3.13 MAINTAINING CLEAN DUCTWORK THROUGHOUT CONSTRUCTION

A. Throughout the duration of construction, all ductwork shall be capped or sealed with sheet metal caps, polyethylene film, or other airtight protective to keep dust, dirt, and construction debris out of ducts. Similar means shall be used to seal air-side connections of HVAC equipment to include, but not limited to, air handling units, fans, terminal air boxes, fan coil units, cabinet heaters, blower coils, and the like.

B. When air terminal devices are installed, contractors shall seal all supply, return, and exhaust grilles with polyethylene film or other airtight protective to keep dust, dirt, and construction debris out of ducts.

C. Should HVAC equipment be started during construction, Contractor shall remove airtight protectives and shall install one-inch thick MERV 8 filter media over all return and exhaust grilles to prevent dust, dirt, and construction debris from entering ductwork. Filter media shall cover the entire grille face and shall be secured such that air cannot bypass filter media.

D. Should filter media become laden with dust and dirt, Contractor shall replace filter media with new media to prevent damage to air distribution system and equipment.

E. The following steps shall be taken during testing, adjusting, and balancing of each air system:

1. All construction activities in all spaces served by the air system shall stop.
2. All airtight protectives and temporary filter media shall be removed from all portions of the air system.
3. Testing, adjusting, and balancing work shall not commence until all construction activity is stopped and all airtight protectives and temporary filter media is removed.
4. Once testing, adjusting, and balancing work is complete for the air system, airtight protectives or temporary filter media shall be installed over all ductwork openings and air terminals on the air system prior to resuming construction activities in any spaces served by the air system.

F. The Owner shall agree the building is sufficiently clean prior to the removal of any filtration media and airtight protectives from air terminal devices.

3.14 UTILITY REBATE

A. Submit utility rebate forms, where offered at project location, with rebate items completed. Rebate may include lighting, lighting controls, variable speed drives, heat pumps, package terminal A/C, air conditioners, chillers, water heaters, programmable thermostats, and motors.

B. Contractor must submit notification of any value engineering or product substitution that will affect the utility rebate amount prior to approval.

READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

To prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to your requesting a final job observation.

1. Penetrations fire sealed and labeled in accordance with specifications.
2. All air handling units operating and balanced.
3. All fans shall be operating and balanced.
4. All pumps, boilers and chillers operating and balanced.
5. All miscellaneous mechanical systems (unit heaters, fan coil units, cabinet heaters, etc.) operating.
6. All temperature control systems operating, programmed and calibrated.
7. Pipe insulation complete, pipes labeled and valves tagged.
8. Fire damper and fire/smoke damper access doors labeled in accordance with specifications.

Accepted by:

Prime Contractor _____

By _____ Date _____

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Architect/Engineer so that the final observation can be scheduled.

It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

END OF SECTION 23 05 00

SECTION 23 05 05 - HVAC DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Mechanical demolition.

B. Cutting and Patching.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment shall be as specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. THE DRAWINGS ARE INTENDED TO INDICATE THE GENERAL SCOPE OF WORK AND DO NOT SHOW EVERY PIPE, DUCT, OR PIECE OF EQUIPMENT THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE AND VERIFY CONDITIONS PRIOR TO SUBMITTING A BID.

B. Where walls, ceilings, etc., are shown as being removed on general drawings, the Contractor shall remove all mechanical equipment, devices, fixtures, piping, ducts, systems, etc., from the removed area.

C. Where ceilings, walls, partitions, etc., are temporarily removed and replaced by others, This Contractor shall remove, store, and replace equipment, devices, fixtures, pipes, ducts, systems, etc.

D. Verify that abandoned utilities serve only abandoned equipment or facilities. Extend services to facilities or equipment that shall remain in operation following demolition.

E. Coordinate work with all other Contractors and the Owner. Schedule removal of equipment to avoid conflicts.

F. This Contractor shall verify all existing equipment sizes and capacities where equipment is scheduled to be replaced or modified, prior to ordering new equipment.

G. Bid submittal shall mean the Contractor has visited the project site and verified existing conditions and scope of work.

3.2 PREPARATION

A. Disconnect mechanical systems in walls, floors, and ceilings scheduled for removal.

B. Provide temporary connections to maintain existing systems in service during construction. When work must be performed on operating equipment, use personnel experienced in such operations.

C. Existing Heating System: Maintain existing system in service until new system is complete and ready for service. Drain system only to make switchovers and connections. Obtain permission from the Owner at least 48 hours before partially or completely draining system. Minimize outage duration.

3.3 DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK

A. Demolish and extend existing mechanical work under provisions of Division 2 and this Section.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned ducts and piping to source of supply and/or main lines.

D. Remove exposed abandoned pipes and ducts, including abandoned pipes and ducts above accessible ceilings. Cut ducts flush with walls and floors, cap duct that remains, and patch surfaces. Cut pipes above ceilings, below floors and behind walls. Cap remaining lines. Repair building construction to match original. Remove all clamps, hangers, supports, etc. associated with pipe and duct removal.

E. Disconnect and remove mechanical devices and equipment serving equipment that has been removed.

F. Repair adjacent construction and finishes damaged during demolition and extension work.

G. Maintain access to existing mechanical installations which remain. Modify installation or provide access panels as appropriate.

H. Remove unused sections of supply and return air ductwork back to mains. Patch opening with sheet metal and seal airtight. Patch existing insulation to match existing. Where existing ductwork is to be capped and reused, locate the end cap within 6" of the last branch. End caps shall be 3" pressure class and seal class "A".

I. Extend existing installations using materials and methods compatible with existing installations, or as specified.

J. Properly reclaim and dispose of all refrigerant in demolished equipment and as required for extension of existing equipment.

3.4 CUTTING AND PATCHING

A. This Contractor is responsible for all penetrations of existing construction required to complete the work of this project. Refer to Section 23 05 29 for additional requirements.

B. Penetrations in existing construction should be reviewed carefully prior to proceeding with any work.

C. Penetrations shall be neat and clean with smooth and/or finished edges. Core drill where possible for clean opening.

D. Repair existing construction as required after penetration is complete to restore to original condition. Use similar materials and match adjacent construction unless otherwise noted or agreed to by the Architect/Engineer prior to start of work.

E. Floor slab on grade is a structural slab. All penetrations shall be X-rayed prior to cutting and/or drilling to avoid rebar or utilities encased in floor construction. Provide rebar dowels to replace damaged rebar and pin existing slab with patched slab. Refer to structural plans for additional information.

F. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.

3.5 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Clean all systems adjacent to project which are affected by the dust and debris caused by this construction.

C. MECHANICAL ITEMS REMOVED AND NOT RELOCATED REMAIN THE PROPERTY OF THE OWNER. CONTRACTOR SHALL PLACE ITEMS RETAINED BY THE OWNER IN A LOCATION COORDINATED WITH THE OWNER. THE CONTRACTOR SHALL DISPOSE OF MATERIAL THE OWNER DOES NOT WANT TO REUSE OR RETAIN FOR MAINTENANCE PURPOSES.

3.6 SPECIAL REQUIREMENTS

A. Install temporary filter media over outside air intakes which are within 100 feet of the limits of construction or as noted on the drawings. This Contractor shall complete any cleaning required for existing systems which are affected by construction dust and debris.

B. Review locations of all new penetrations in existing floor slabs or walls. Determine construction type and review for possible interferences. Bring all concerns to the attention of the Architect/Engineer before proceeding.

END OF SECTION 23 05 05

SECTION 23 05 13 - MOTORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Single Phase and Three Phase Electric Motors.

1.2 SUBMITTALS

A. Submit shop drawings under provisions of Section 23 05 00. Include nominal efficiency and power factor for all premium efficiency motors. Efficiencies must meet or exceed the nominal energy efficiency levels presented below.

B. Submit shop drawings for all three phase motors.

C. Submit motor data with equipment when motor is installed by the manufacturer at the factory.

D. Submit shaft grounding rings or brushes or ceramic bearings for all motors as required.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weatherproof coverings. For extended outdoor storage, follow manufacturer's recommendations for equipment and motor.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data including assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of commercial and industrial motors and accessories, with a minimum of three years documented manufacturing experience.

PART 2 - PRODUCTS

2.1 MOTORS - GENERAL CONSTRUCTION AND REQUIREMENTS

A. Refer to the drawings for required electrical characteristics. Voltage is generally specified and scheduled as distribution voltage. Motor submittals may be based on utilization voltage if it corresponds to the correct distribution voltage.

Distribution/Nominal Voltage	Utilization Voltage
120	115

208	200
240	230
277	265
480	460

B. Design motors for continuous operation in 40ºC environment, and for temperature rise in accordance with ANSI/NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

C. Explosion-Proof Motors: UL listed and labeled for the hazard classification shown on the drawing, with over-temperature protection.

D. Visible Nameplate: Indicating horsepower, voltage, phase, hertz, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, insulation class.

E. Electrical Connection: Boxes, threaded for conduit. For fractional horsepower motors where connection is made directly, provide conduit connection in end frame.

F. Unless otherwise indicated, motors 3/4 HP and smaller shall be single phase, 60 hertz, open drip-proof or totally enclosed fan-cooled type.

G. Unless otherwise indicated, motors 1 HP and larger shall be three phase, 60 hertz, squirrel cage type, NEMA Design Code B (low current in-rush, normal starting torque), open drip-proof or totally enclosed fan-cooled type.

H. Each contractor shall set all motors furnished by him.

I. All motors shall have a minimum service factor of 1.15.

J. All motors shall have ball or roller bearings with a minimum L-10 fatigue life of 150,000 hours in direct-coupled applications and 50,000 hours for belted applications. Belted rating shall be based on radial loads and pulley sizes called out in NEMA MG1-14.43.

K. Bearings shall be sealed type for 10 HP and smaller motors. Bearings shall be regreasable type for larger motors.

L. Aluminum end housings are not permitted on motors 15 HP or larger.

M. Motor Driven Equipment:

1. No equipment shall be selected or operate above 90% of its motor nameplate rating. Motor size may not be increased to compensate for equipment with efficiency lower than that specified.
2. If a larger motor than specified is required on equipment, the contractor supplying the equipment is responsible for all additional costs due to larger starters, wiring, etc.

N. Provide all belted motors with a means of moving and securing the motor to tighten belts. Motors over 2 HP shall have screw type tension adjustment. Motors over 40 HP shall have dual screw adjusters. Slide bases shall conform to NEMA standards.

O. Motors for fans and pumps 1/12 HP or greater and less than 1 HP shall be electronically-commutated motors or shall have a minimum motor efficiency of 70% when rated in accordance with DOE 10 CFR 431. These motors shall also have the means to adjust motor speed for either balancing or remote control. Belt-driven fans may use sheave adjustments for airflow balancing in lieu of varying motor speed.

2.2 ELECTRICALLY COMMUTATED MOTORS (ECM)

A. Motor shall be variable speed, constant torque, brushless DC motor for direct-drive applications. Electronics shall be encapsulated for moisture protection and shall integral surge protection. Motor shall be pre-wired for specific voltage and phase.

B. Motor frame shall be NEMA 48; UL recognized components shall be provided for the motor construction.

C. All EC motors shall be a minimum of 85% efficient at all speeds.

D. Motors shall be permanently lubricated; utilize ball bearings to match with the connected driven equipment.

E. Provide motor with on-board motor control module. Motor speed shall be limited to provide electronic over current protection. Starter shall provide soft start to reduce inrush current and shall be controllable from 20% to 100% of full rated speed.

F. Operational mode shall be as scheduled and shall be one of the following:

1. Constant Flow
2. Constant Temperature
3. Constant Pressure

2.3 PREMIUM EFFICIENCY MOTORS (INCLUDING MOST 3-PHASE GENERAL PURPOSE MOTORS)

A. All motors, unless exempted by EPAct legislation that became federal law on December 19, 2010, shall comply with the efficiencies listed in that standard, which are reprinted below. These match the 2010 NEMA premium efficiency ratings. All ratings listed are nominal full load efficiencies, verified in accordance with IEEE Standard 112, Test Method B. Average expected (not guaranteed minimum) power factors shall also be at least the following:

	Full-Load Efficiencies %					
	Open Drip-Proof			Totally Enclosed Fan Cooled		
HP	1200 rpm	1800 rpm	3600 rpm	1200 rpm	1800 rpm	3600 rpm
1.0	82.5	85.5	77.0	82.5	85.5	77.0
1.5	86.5	86.5	84.0	87.5	86.5	84.0

2.0	87.5	86.5	85.5	88.5	86.5	85.5
3.0	88.5	89.5	85.5	89.5	89.5	86.5
5.0	89.5	89.5	86.5	89.5	89.5	88.5
7.5	90.2	91.0	88.5	91.0	91.7	89.5
10.0	91.7	91.7	89.5	91.0	91.7	90.2
15.0	91.7	93.0	90.2	91.7	92.4	91.0
20.0	92.4	93.0	91.0	91.7	93.0	91.0
25.0	93.0	93.6	91.7	93.0	93.6	91.7

B. Motor nameplate shall be noted with the above ratings.

2.4 MOTORS ON VARIABLE FREQUENCY DRIVES

A. All motors driven by VFDs shall be premium efficiency type.

B. Motors shall be designed for use with VFDs in variable torque applications with 1.15 service factor. Motors shall not be equipped with auxiliary blowers.

C. Motors driven by VFDs shall have Class F or H insulation and be designated by the motor manufacturer to be suitable for inverter duty service in accordance with NEMA MG 1 Section IV, "Performance Standards Applying to All Machines," Part 31 "Definite-Purpose Inverter-Fed Polyphase Motors.

D. All 480 volt motors driven by VFDs shall be provided with shaft grounding rings or grounding brushes or ceramic bearings as a means to protect bearings from adverse shaft currents.

1. Providing grounding rings internal to the motor housing is an acceptable solution, provided the motor is affixed with a label clearly indicating the presence of a grounding assembly. The grounding ring shall be listed for 40,000 hours of motor service and shall be accessible via the drive endplate.
2. Motor shafts 2" and larger require shaft grounding on the drive end and the non-drive end. This Contractor shall ensure (via field observation and measurement) that the shaft is effectively grounded upon startup.
3. In addition to 480 volt motors driven by VFDs, the following critical motors shall also be equipped with shaft grounding rings or brushes or ceramic bearings:

2.5 SHEAVES

A. All sheaves shall conform to NEMA Standard MG1-14.42, which lists minimum diameters and maximum overhangs. Locate motors to minimize overhang.

B. When replacing sheaves, use sheaves of at least the originally supplied sizes.

C. Contractor responsible for motor shall also be responsible for replacement sheaves. Coordinate with testing and balancing of the equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.

B. For flexible coupled drive motors, mount coupling to the shafts in accordance with the coupling manufacturer's recommendations. Align shafts to manufacturer's requirements or within 0.002 inch per inch diameter of coupling hub.

C. For belt drive motors, mount sheaves on the appropriate shafts per manufacturer's instructions. Use a straight edge to check alignment of the sheaves. Reposition sheaves as necessary so the straight edge contacts both sheave faces squarely. After sheaves are aligned, loosen the adjustable motor base so the belt(s) can be added, and tighten the base so the belt tension is in accordance with the drive manufacturer's recommendations. Frequently check belt tension and adjust if necessary during the first day of operation and again after 80 hours of operation.

END OF SECTION 23 05 13

SECTION 23 05 29 - HVAC SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Hangers, Supports, and Associated Anchors.

B. Equipment Bases and Supports.

C. Sleeves and Seals.

D. Flashing and Sealing of Equipment and Pipe Stacks.

E. Cutting of Openings.

F. Escutcheon Plates and Trim.

1.2 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Furnish sleeves and hanger inserts to General Contractor for placement into formwork.

PART 2 - PRODUCTS

2.1 SEISMIC RESTRAINTS

A. Refer to Section 23 05 50 for additional requirements for seismic restraints.

2.2 HANGER RODS

A. Hanger rods for single rod hangers shall conform to the following:

	Hanger Rod Diameter	
Pipe Size	Column #1	Column #2
2-1/2" and smaller	3/8"	3/8"
3" through 3-5/8"	3/8"	3/8"
4" and 5"	1/2"	1/2"
6"	3/4"	5/8"
8" through 12"	7/8"	3/4"

Column #1: Steel pipe.
Column #2: Copper, plastic and fiberglass reinforced pipe.

B. Rods for double rod hangers may be reduced one size. Minimum rod diameter is 3/8 inches.

C. Hanger rods and accessories used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.

D. All hanger rods, nuts, washers, clevises, etc., in damp areas shall have ASTM A123 hot-dip galvanized finish applied after fabrication. This applies to the following areas:

1. Mechanical Rooms.
2. Sally Port Garage Area
3. Holding Mechanical Chase

2.3 FOUNDATIONS, BASES, AND SUPPORTS

A. Basic Requirements:

1. Furnish and install foundations, bases, and supports (not specifically indicated on the Drawings or in the Specifications of either the General Construction or Mechanical work as provided by another Contractor) for mechanical equipment.
2. All concrete foundations, bases and supports, shall be reinforced. All steel bases and supports shall receive a prime coat of zinc chromate or red metal primer. After completion of work, give steel supports a final coat of gray enamel.

B. Concrete Bases (Housekeeping Pads):

1. Refer to Section 23 05 50 for additional requirements for concrete bases in seismic applications.
2. Unless shown otherwise on the drawings, concrete bases shall be nominal 4 inches thick and shall extend 3 inches on all sides of the equipment (6 inches larger than factory base).
3. Where a base is less than 12 inches from a wall, extend the base to the wall to prevent a "dirt-trap".
4. Concrete materials and workmanship required for the Contractor's work shall be provided by the Contractor. Materials and workmanship shall conform to the applicable standards of the Portland Cement Association. Reinforce with 6"x6", W1.4-W1.4 welded wire fabric. Concrete shall withstand 3,000 pounds compression per square inch at 28 days (be 20 MPa strength).
5. Equipment requiring bases is as follows:

a. Air Handling Unit
b. Expansion Tank
c. Fans
d. Pump
e. Tank

C. Supports:

1. Provide sufficient clips, inserts, hangers, racks, rods, and auxiliary steel to securely support all suspended material, equipment and conduit without sag.
2. Hang heavy equipment from concrete floors or ceilings with Architect/Engineer-approved concrete inserts, furnished and installed by the Contractor whose work requires them, except where indicated otherwise.

D. Grout:

1. Grout shall be non-shrinking premixed (Master Builders Company "Embecco"), unless otherwise indicated on the drawings or approved by the Architect/Engineer.
2. Use Mix No. 1 for clearances of 1" or less, and Mix No. 2 for all larger clearances.
3. Grout under equipment bases, around pipes, at pipe sleeves, etc., and where shown on the drawings.

2.4 OPENINGS IN FLOORS, WALLS AND CEILINGS

A. Exact locations of all openings for the installation of materials shall be determined by the Contractor and given to the General Contractor for installation or construction as the structure is built.

B. Coordinate all openings with other Contractors.

C. Hire the proper tradesman and furnish all labor, material and equipment to cut openings in or through existing structures, or openings in new structures that were not installed, or additional openings. Repair all spalling and damage to the satisfaction of the Architect/Engineer. Make saw cuts before breaking out concrete to ensure even and uniform opening edges.

D. Said cutting shall be at the complete expense of each Contractor. Failure to coordinate openings with other Contractors shall not exempt the Contractor from providing openings at Contractor's expense.

E. Do not cut structural members without written approval of the Architect or Structural Engineer.

F. Exposed Housing Penetrations: Seal pipes with surface temperature below 150°F, penetrating housings with conical stepped, white silicone, EPDM or neoprene pipe flashings and stainless steel clamps equal to Portals Plus Pipe Boots or Pipetite.

2.5 ROOF PENETRATIONS

A. Roof Curb Enclosure: Provide weatherproof roof curb and enclosure for duct penetrations. Refer to drawings for details.

B. Conical Pipe Boot: Seal pipes with surface temperature below 150°F penetrating single-ply roofs with conical stepped, UV-resistant silicone, EPDM or neoprene pipe flashings and stainless steel clamps equal to Portals Plus Pipe Boots or Pipetite. Color: shall match roofing material.

C. Break insulation only at the clamp for pipes between 60°F and 150°F. Seal outdoor insulation edges watertight.

2.6 SLEEVES AND LINTELS

A. Each Contractor shall provide sleeves and lintels for all duct and pipe openings required for the Contractor's work in masonry walls and floors, unless specifically shown as being by others.

B. Fabricate all sleeves from standard weight black steel pipe or as indicated on the drawings. Provide continuous sleeve. Cut or split sleeves are not acceptable.

C. Fabricate all lintels for masonry walls from structural steel shapes or as indicated on the drawings. Have all lintels approved by the Architect or Structural Engineer.

D. Sleeves through the floors on exposed risers shall be flush with the ceiling, with planed squared ends extending 1" above the floor in unfinished areas, and flush with the floor in finished areas.

E. Sleeves shall not penetrate structural members or masonry walls without approval from the Structural Engineer. Sleeves shall then comply with the Architect/Engineer's design.

F. Openings through unexcavated floors and/or foundation walls below the floor shall have a smooth finish with sufficient annular space around material passing through opening so slight settling will not place stress on the material or building structure.

G. Install all sleeves concentric with pipes. Secure sleeves in concrete to wood forms. This Contractor is responsible for sleeves dislodged or moved when pouring concrete.

H. Where pipes rise through concrete floors that are on earthen grade, provide 3/4" resilient expansion joint material (e.g., foam, rubber, asphalt-coated fiber, bituminous-impregnated felt, or cork) wrapped around the pipe, the full depth of concrete, at the point of penetration. Secure to prevent shifting during concrete placement and finishing.

I. Size sleeves large enough to allow expansion and contraction movement. Provide continuous insulation wrapping.

J. Wall Seals ("Link-Seals"):

1. Where shown on the drawings, pipes passing through walls, ceilings, or floors shall have their annular space (sleeve or drilled hole - not tapered hole made with knockout plug) sealed by properly sized sealing elements consisting of a synthetic rubber material compounded to resist aging, ozone, sunlight, water and chemical action.
2. Sleeves, if used, shall be standard weight steel with primed finish and waterstop/anchor continuously welded to sleeve. If piping carries only fluids below 120°F, sleeves may be thermoplastic with integral water seal and textured surface.
3. Sleeves shall be at least 2 pipe sizes larger than the pipes.
4. Pressure shall be maintained by stainless steel bolts and other parts. Pressure plates may be of composite material for Models S and OS.
5. Sealing element shall be as follows:

Model	Service	Element Material	Temperature Range
S	Standard (Stainless)	EPDM	-40°F to 250°F
T	High/Low Temperature (Steam)	Silicone	-67°F to 400°F
T	Fire Seals (1 hour)	Silicone	-67°F to 400°F
FS	Fire Seals (3 hours)	Silicone	-67°F to 400°F
OS	Oil Resistant/Stainless	Nitrile	-40°F to 210°F

6. Manufacturers:

   a. Thunderline Corporation "Link-Seals"
   b. O-Z/Gedney Company
   c. Calpico, Inc.
   d. Innerlynx
   e. Metraflex Company (cold service only)

2.7 ESCUTCHEON PLATES AND TRIM

A. Fit escutcheons to all insulated or uninsulated exposed pipes passing through walls, floors, or ceilings of finished rooms.

B. Escutcheons shall be heavy gauge, cold rolled steel, copper coated under a chromium plated finish, heavy spring clip, rigid hinge and latch.

C. Install galvanized steel (unless otherwise indicated) trim strip to cover vacant space and raw construction edges of all rectangular openings in finished rooms. This includes pipe openings.

2.8 PIPE PENETRATIONS

A. Seal all pipe penetrations. Seal non-rated walls and floor penetrations with grout or caulk. Backing material may be used.

B. Seal fire rated wall and floor penetrations with fire seal system as specified.

2.9 PIPE ANCHORS

A. Provide all items needed to allow adequate expansion and contraction of all piping. All piping shall be supported, guided, aligned, and anchored as required.

B. Repair all piping leaks and associated damage. Pipes shall not rub on any part of the building.

2.10 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

PART 3 - EXECUTION

3.1 HVAC SUPPORTS AND ANCHORS

A. General Installation Requirements:

1. Install all items per manufacturer's instructions.
2. Coordinate the location and method of support of piping systems with all installations under other Divisions and Sections of the Specifications.
3. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
4. Supports shall extend directly to building structure. Do not support piping from duct hangers unless coordinated with sheet metal contractor prior to installation. Do not allow lighting or ceiling supports to be hung from piping supports.

B. Supports Requirements:

1. Where building structural steel is fireproofed, all hangers, clamps, auxiliary steel, etc., which attach to it shall be installed prior to application of fireproofing. Repair all fireproofing damaged during pipe installation.
2. Set all concrete inserts in place before pouring concrete.
3. Furnish, install and prime all auxiliary structural steel for support of piping systems that are not shown on the Drawings as being by others.
4. Install hangers and supports complete with lock nuts, clamps, rods, bolts, couplings, swivels, inserts and required accessories.
5. Hangers for horizontal piping shall have adequate means of vertical adjustment for alignment.

C. Provided the installation complies with all loading requirements of truss and joist manufacturers, the following practices are acceptable:

1. Loads of 100 lbs. or less may be attached anywhere along the top or bottom chords of trusses or joists with a minimum 3' spacing between loads.
2. Loads greater than 100 lbs. must be hung concentrically and may be hung from top or bottom chord, provided one of the following conditions is met:

    a. The hanger is attached within 6" from a web/chord joint.
    b. Additional L2x2x1/4 web reinforcement is installed per manufacturer's requirements.

3. It is prohibited to cantilever a load using an angle or other structural component that is attached to a truss or joist in such a fashion that a torsional force is applied to that structural member.
4. If conditions cannot be met, coordinate installation with truss or joist manufacturer and contact Architect/Engineer.

D. After piping and insulation installation are complete, cut hanger rods back at trapeze supports so they do not extend more than 3/4" below bottom face of lowest fastener and blunt any sharp edges.

E. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (limitation not required with concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and architectural items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.

F. Do not exceed the manufacturer's recommended maximum load for any hanger or support.

G. Steel/Concrete Structure: Spacing of hangers shall not exceed the compressive strength of the insulation inserts, and in no case shall exceed the following:

1. Steel and Fiberglass (Std. Weight or Heavier - Liquid Service):

a. Maximum Spacing:

1) 1-1/4" & under: 7'-0"
2) 1-1/2": 9'-0"
3) 2": 10'-0"
4) 2-1/2": 11'-0"
5) 3": 12'-0"
6) 4" & larger: 12'-0"

2. Hard Drawn Copper & Brass (Liquid Service):

a. Maximum Spacing:

1) 3/4" and under: 5'-0"
2) 1": 6'-0"
3) 1-1/4": 7'-0"
4) 1-1/2" 8'-0"
5) 2": 8'-0"
6) 2-1/2": 9'-0"
7) 3": 10'-0"
8) 4": 12'-0"
9) 6": 12'-0"

H. Installation of hangers shall conform to MSS SP-58, 69, and 89.

END OF SECTION 23 05 29

SECTION 23 05 48 - HVAC VIBRATION ISOLATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Vibration Isolation.

B. Flexible Connectors.

1.2 SUBMITTALS

A. Submit shop drawings per Section 23 05 00 and the Vibration Isolation Submittal Form at the end of this section.

B. Vibration isolation submittals may be included with equipment being isolated, but must comply with this section.

C. Base submittals shall include equipment served, construction, coatings, weights, and dimensions.

D. Isolator submittals shall include:

1. Equipment served
2. Type of Isolator
3. Load in Pounds per Isolator
4. Recommended Maximum Load for Isolator
5. Spring Constants of Isolators (for Spring Isolators)
6. Load vs. Deflection Curves (for Neoprene Isolators)
7. Specified Deflection
8. Deflection to Solid (at least 150% of calculated deflection)
9. Loaded (Operating) Deflection
10. Free Height
11. Loaded Height
12. Kx/Ky (horizontal to vertical stiffness ratio - for spring isolators)
13. Materials and Coatings
14. Spring Diameters

E. Make separate calculations for each isolator on equipment where the load is not equally distributed.

F. Flexible connector shop drawings shall include overall face-to-face length and all specified properties.

G. Submit certification that equipment, accessories, and components will withstand seismic forces defined in Section 23 05 50. Include the following:

1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

PART 2 - PRODUCTS

2.1 BASIC CONSTRUCTION AND REQUIREMENT

A. Vibration isolation for this project is subject to seismic restraint requirements of Section 23 05 50.

B. Vibration isolators shall have either known undeflected heights or other markings so deflection under load can be verified.

C. All isolators shall operate in the linear portion of their load versus deflection curve. The linear portion of the deflection curve of all spring isolators shall extend 50% beyond the calculated operating deflection (e.g., 3" for 2" calculated deflection). The point of 50% additional deflection shall not exceed the recommended load rating of the isolator.

D. The lateral to vertical stiffness ratio (Kx/Ky) of spring isolators shall be between 0.8 and 2.0.

E. All neoprene shall have UV resistance sufficient for 20 years of outdoor service.

F. All isolators shall be designed or treated for corrosion resistance. Steel bases shall be cleaned of welding slag and primed for interior use, and hot dip galvanized after fabrication for exterior use. All bolts and washers over 3/8" diameter located outdoors shall be hot dip galvanized per ASTM A153. All other bolts, nuts and washers shall be zinc electroplated. All ferrous portions of isolators, other than springs, for exterior use shall be hot dip galvanized after fabrication. Outdoor springs shall be neoprene dipped or hot dip galvanized. All damage to coatings shall be field repaired with two coats of zinc rich coating.

G. Equip all mountings used with structural steel bases with height-saving brackets. Bottoms of the brackets shall be 1-1/2" to 2-1/2" above the floor or housekeeping pad, unless shown otherwise on the drawings. Steel bases shall have at least four points of support.

H. Provide motor slide rails for belt-driven equipment per Section 23 05 13.

I. All isolators, except M1, shall have provision for leveling.

2.2 MOUNTINGS

A. Type M1:

1. 0.75" thick waffled neoprene pad with minimum static deflection of 0.07" at calculated load and 0.11" at maximum load. For loads less than 15 pounds, the deflection at calculated load requirement is waived, but the isolator must have a maximum stiffness of the ratio of 45#/0.35".
2. Units need not be bolted down unless called for or needed to prevent movement. If bolted down, prevent short circuiting with neoprene bushings and washers between bolts and isolators.
3. Manufacturers:

    a. Mason "Super W"
    b. Kinetics "NGS"
    c. Amber/Booth "SPNR"
    d. Vibration Eliminator Co. "400N"

2.3 THRUST RESTRAINTS

A. Type TR1:

1. Horizontal thrust restraints shall consist of spring elements in neoprene cups with grommets to prevent short circuiting hanger rods and nuts and washers for pre-compression.
2. Select springs for deflection of 0.75" to 1.50" at maximum calculated thrust. Springs shall be field adjusted for 1/2" movement. Spring constant may not exceed 50% of the vertical stiffness of the mounts (M3, etc.).
3. Centrifugal fans shall incline slightly forward when off and discharge directly in line with the ductwork at maximum static pressure.
4. Fabricate structural supports as needed to attach thrust restraints.
5. If connected to a housing, check maximum thrust the housing can restrain and connections required.
6. Manufacturers:

    a. Mason "WB" or "PC30"
    b. Kinetics
    c. Vibration Eliminator Co. "HTR-1"

2.4 HANGERS

A. Type H1:

1. Vibration hangers shall consist of a double-deflection neoprene element with a projecting bushing or oversized opening to prevent steel-to-steel contact.
2. Static deflection shall be at least 0.15" at calculated load and 0.35" at maximum rated load.
3. Provide hangers with end connections as required for hanging ductwork or piping.
4. Manufacturers:

a. Mason "HD"
b. Kinetics "RH"
c. Aeroflex "RHD"
d. Vibration Eliminator Co. "IC/3C/3CTD"
e. Vibro Acoustics "RH"

2.5 FLEXIBLE CONNECTORS (NOISE AND VIBRATION ELIMINATORS)

A. Type FC1:

1. Spherical flexible connectors with multiple plies of nylon tire cord fabric and either EPDM or molded and cured neoprene. Outdoor units shall be EPDM.
2. Steel aircraft cables or threaded steel rods shall be used to prevent excess elongation.
3. All straight through connections shall be made with twin-spheres properly pre-extended as recommended by the manufacturer.
4. Connectors up to 2" size may have threaded ends.
5. Connectors 2-1/2" and over shall have floating steel flanges recessed to lock raised face neoprene flanges.
6. All connectors shall be rated for a minimum working pressure of 150 psi at 200°F.
7. Manufacturer:

a. Metraflex "Double Cable-Sphere"
b. Minnesota Flex Corp.
c. Mercer "200 Series"
d. Twin City Hose "MS2".

B. Type FC2:

1. Stainless steel flexible connectors with corrugated stainless steel hose body and stainless steel braided casing.
2. Rated for minimum working pressures of 150 psi at 70°F and 100 psi at 800°F .
3. Sizes 2" and under shall have steel threaded connections.
4. Sizes 2-1/2" and over shall have 150 lb. steel flanges.
5. Suitable for 1/2" permanent misalignment.
6. Manufacturers:

a. Mason or Mercer "BSS-GU"
b. Metraflex "ML"
c. Twin City Hose "TCHS"
d. American "BOA B4-1"
e. Flexible Metal Hose Company "FM-21"
f. or Wheatley.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Install all products per manufacturer's recommendations.

B. Provide vibration isolation as indicated on the drawings and as described herein.

C. Clean the surface below all mountings that are not bolted down and apply adhesive cement equal to Mason Type WG between mounting and floor. If movement occurs, bolt mountings down. Isolate bolts from baseplates with neoprene washers and bushings.

D. All static deflections listed in the drawings and specifications are the minimum acceptable actual deflection of the isolator under the weight of the installed equipment - not the maximum rated deflection of the isolator.

E. Support equipment to be mounted on structural steel frames with isolators under the frames or under brackets welded to the frames. Where frames are not needed, fasten isolators directly to the equipment.

F. Where a specific quantity of hangers is noted in these specifications, it shall mean hanger pairs for support points that require multiple hangers, such as rectangular ducts or pipes supported on a strut rack.

3.2 PIPE ISOLATION

A. The first three hangers from vibration-isolated equipment shall be type H1.

B. The first five hangers from vibration-isolated equipment shall have spring isolators with the same static deflection as the equipment. Use type H1 or H2 as required for the specified deflection. The next five hangers shall be type H1.

C. For base mounted pumps without resilient mountings, the first five hangers shall be Type H1.

D. Install flexible connectors in all piping connected to vibration producing equipment. This includes all fans, base-mounted pumps, compressors, etc. Absence of flexible connectors on piping diagrams does not imply that they are not required.

E. Use Type FC1 where pressures are lower than 150 psi, temperatures are below 220°F , and the fluid handled is compatible with neoprene and EPDM.

F. Use Type FC2 for all other services. FC2 shall be installed parallel with equipment shafts.

G. Provide sufficient piping flexibility for vibrating refrigerant equipment or furnish flexible connectors with appropriate temperature and pressure ratings.

H. Support piping to prevent extension of flexible connectors.

END OF SECTION 23 05 48

SECTION 23 05 50 - SEISMIC REQUIREMENTS FOR EQUIPMENT AND SUPPORTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Seismic Requirements.

1.2 QUALITY ASSURANCE

A. General:

1. The contractor shall retain a specialty consultant or equipment manufacturer to develop a seismic restraint and support system and perform seismic calculations in accordance with these specifications, state, and local codes.
2. Items used for seismic restraint of equipment and systems shall be specifically manufactured for seismic restraint.
3. These requirements are beyond those listed in Section 23 05 29 of these specifications. Where a conflict arises between the seismic requirements of this section and any other section, the Architect/Engineer shall be immediately notified for direction to proceed.

B. Manufacturer:

1. System Supports/Restraints: Company specializing in the manufacture of products specified in this Section.
2. Equipment: Each company providing equipment that must meet seismic requirements shall provide certification included in project submittals the equipment supplied for the project meets or exceeds the seismic requirements of the project.

C. Testing Agency: An independent testing agency, acceptable to Authorities Having Jurisdiction, with experience and capability to conduct the testing indicated.

D. Installer: Company specializing in performing the work of this Section.

1.3 SUBMITTALS

A. Submit under provisions of Section 23 05 00.

B. Shop Drawings:

1. Calculations, restraint selections, and installation details shall be designed and sealed by a Professional Engineer licensed in the state where the project is located experienced in seismic restraint design and installation.
2. Coordination Drawings: Plans and sections drawn to scale, coordinating seismic bracing of mechanical components with other systems and equipment in the vicinity, including other seismic restraints.

3. Manufacturer's Certifications: Professional Engineer licensed in the state where the project is located shall review and approve manufacturer's certifications of compliance.
4. System Supports/Restraints - Submit for each condition requiring seismic bracing:

    a. Calculations for each seismic brace and detail utilized on the project.
    b. Plan drawings showing locations and types of seismic braces on contractor fabrication/installation drawings.
    c. Cross-reference between details and plan drawings to indicate exactly which brace is being installed at each location. Details provided are to clearly indicate attachments to structure, correctly representing the fastening requirements of bracing.
    d. Clear indication of brace design forces and maximum potential component forces at attachment points to building structure for confirmation of acceptability by the Structural Engineer of Record.

5. Equipment - Submit for each piece of equipment supplied:

    a. Certification that the equipment supplied for the project meets or exceeds the seismic requirements specified.
    b. Specific details of seismic design features of equipment and maximum seismic loads imparted to the structural support.
    c. Engineering calculations and details for equipment anchorage and support structure.

C. A seismic restraint designer shall be provided whether or not exceptions listed in the applicable building code are met. If seismic restraints are not provided for a system that requires seismic bracing, the seismic designer shall submit a signed and sealed letter to the Architect/Engineer and Authorities Having Jurisdiction stating the exceptions, along with code reference, utilized for each item. Seismic designer shall review system installation for general conformance to the exception requirements stated in the code and document, in writing, the system has been installed in accordance to the exception.

1.4 TESTING AND INSPECTION

A. Special Inspection and Testing shall be done in accordance with Chapter 17 of the International Building Code.

B. The Owner shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704 and 1705.

C. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected. The fabricator shall submit a certificate of compliance that the work has been performed in accordance with the approved plans and specifications to the building official and the Architect and Engineer of Record.

D. The Special Inspection Agency shall furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The reports shall be completed and furnished within 48 hours of inspected work. A final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency's knowledge, in conformance with the approved plans and specifications shall be submitted.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site. Accept material on site in factory containers and packing. Inspect for damage. Protect from damage and contamination by maintaining factory packaging until installation. Follow manufacturer's instructions for storage.

1.6 DESIGN REQUIREMENTS

A. This project is subject to the seismic bracing requirements of the International Building Code, 2012 edition.

B. The following criteria are applicable to this project:

1. Risk Category: IV
2. Seismic Importance Factor: I_E = 1.5Seismic Design Category: D
3. Component Amplification Factors (ap) and Component Response Modification Factors (Rp) shall be taken from Table 13.5-1 in ASCE 7-16 for the individual equipment or system being restrained.
4. Component Importance Factors (Ip) shall be taken from Section 1621.1.6 in IBC 200013.1.3 in ASCE 7-16 for the individual equipment or system being restrained.
5. The total height of the structure and the height of the system to be restrained within the structure shall be determined in coordination with architectural plans and the General Contractor.

C. Forces shall be calculated with the above requirements and Equation 13.3-1, -2, and -3 of ASCE 7-16, unless exempted by 13.1.4. Equipment shall meet International Building Code and ASCE 7 seismic qualification requirements in concurrence with ICC ES AC156 Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems.

D. All seismic anchorage and bracing shall comply with the St. Louis County Rules & Regulations on Anchorage & Sway Bracing - Mechanical, Electrical & Plumbing (MEP) System Components.

E. All seismic anchorage and bracing shall comply with FM Global Property Loss Prevention Data Sheet 1-11, Fire Following Earthquakes.

1.7 COORDINATION

A. Coordinate layout and installation of seismic bracing with building structural systems and architectural features, and with mechanical, fire-protection, electrical and other building features in the vicinity.

B. Coordinate concrete bases with building structural system.

1.8 WARRANTY

A. Provide one-year warranty on parts and labor for manufacturer defects and installation workmanship.

PART 2 - PRODUCTS

2.1 SUPPLIERS

A. Following is a partial list of manufacturer/supplier contact information for seismic restraints:

1. B-Line Systems, Inc. (800) 851-7415, www.b-line.com.
2. Unistrut Corporation http://www.unistrut.us/
3. Kinetics Noise Control (877) 457-2695, www.kineticsnoise.com.
4. Mason Industries, Inc. www.mason-ind.com.
5. Loos & Co., Inc. (800) 321-5667, www.loosnaples.com.
6. Tolco (909) 737-5599, www.tolco.com
7. ISAT 877.523.6060, www.isatsb.com
8. Vibro-Acoustics (416) 291-7371, https://virs.vibro-acoustics.com/

2.2 SEISMIC DESIGN CRITERIA

A. This section describes the requirements for seismic restraint of systems and equipment related to continued operation of the facility after a design seismic event.

B. Definitions

1. Stay in Place:

a. All systems and equipment shall be anchored and restrained such that the anchoring system is intended not to fail and equipment and/or system components will not fall.

2.3 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

A. General:

1. Seismic restraint designer shall coordinate all attachments with the Structural Engineer of Record; refer to submittal requirements.
2. The seismic restraint design shall be based on actual equipment data obtained from manufacturer's submittals or the manufacturer. The equipment manufacturer shall verify and provide written certification the attachment points on the equipment can accept the combination of seismic, weight, and other imposed loads.
3. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.

4. Analysis shall detail anchoring methods, bolt diameter, embedment, and weld length.
5. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code.
6. All seismic restraints and combination isolator/restraints shall have verification of their seismic capabilities witnessed by an independent testing agency.

B. Friction from gravity loads shall not be considered resistance to seismic forces.

C. Fire protection systems shall meet the requirements of NFPA-13 and NFPA-14 for the building seismic requirements.

D. Housekeeping Pads:

1. Reinforced housekeeping pads shall be provided to handle shear, tension, and compression forces with proper reinforcement, doweling, and attachments connecting the pad to the structural slab.

2.4 SEISMIC RESTRAINT AND CONSTRUCTION OF EQUIPMENT

A. Equipment supplied for the project shall be designed to meet the requirements of lateral forces calculated using the applicable code and method described above.

B. The following is a partial list of equipment that shall be restrained and that shall be constructed to meet seismic forces described in this section:

1. Pumps
2. Tanks
3. Air Handling Units

2.5 MATERIALS

A. Use the following materials for restraints:

1. Indoor Dry Locations: Steel, zinc plated.
2. Outdoors and Damp Locations: Galvanized steel.
3. Corrosive Locations: Stainless steel.

2.6 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

A. Strength: Defined in reports by ICC Evaluation Service or another agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.

B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type. Comply with IBC, ACI and ICC ES requirements for cracked concrete anchors.

C. Concrete Inserts: Steel-channel type.

D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM F3125, Grade A 325.

E. Welding Lugs: Comply with MSS SP-69, Type 57.

F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.

G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings and matched to the type and size of anchor bolts and studs used.

H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings and matched to the type and size of attachment devices used.

2.7 SEISMIC BRACING COMPONENTS

A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch-thick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.

1. Materials for Channel: ASTM A 1011, GR 33.
2. Materials for Fittings and Accessories: ASTM A 635, ASTM A 576, or ASTM A 36.
3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.
4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.

B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.

C. Cable-Type Bracing Assemblies: Zinc-coated, high-strength steel wire rope cable attached to steel thimbles, brackets, and bolts designed for cable service.

1. Arrange units for attachment to the braced component at one end and to the structure at the other end.
2. Wire Rope Cable: Comply with ASTM A 603. Use 49- or 133-strand cable with a minimum strength of 2 times the calculated maximum seismic force to be resisted.

D. Hanger Rod Stiffeners: Slotted steel channels with internally bolted connections to hanger rod.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to the applicable code sections and Authority Having Jurisdiction for the exact seismic restraint requirements of piping, ductwork, conduit, equipment, etc.

B. Layout of transverse and longitudinal bracing shall follow recommendations of approved design standards listed in Part 1 of this specification section.

C. All rigid floor mounted equipment shall have a resilient media between the equipment mounting hole and the anchor bolt in concrete.

D. All seismic restraint systems shall be installed in strict accordance with the manufacturer's written instructions and all certified submittal data.

E. Installation of seismic restraints shall not cause any change in position of equipment, piping, or ductwork, resulting in stresses or misalignment.

F. No rigid connections between equipment and the building structure shall be made that degrade the noise and vibration-isolation system specified.

G. Do not install any equipment, piping, duct, or conduit that makes rigid connections with the building unless isolation is not specified.

H. Coordinate work with all other trades to avoid rigid contact with the building. Any conflicts with other trades that will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions shall be brought to the Architect/Engineer's attention prior to specific equipment selection.

I. Prior to installation, bring to the Architect/Engineer's attention any discrepancies between the specifications and the field conditions, or changes required due to specific equipment selection.

J. Bracing may occur from flanges of structural beams, upper truss cords of bar joists, cast in place inserts, or International Code Council approved seismic anchors for installation in concrete.

K. Cable restraints shall be installed slightly slack to avoid short-circuiting the isolated suspended equipment, ductwork, piping, or conduit.

L. Cable assemblies shall be installed taut on non-isolated systems. Solid braces may be used in place of cables on rigidly attached systems only.

M. Do not install cables over sharp corners.

N. Brace support rods when necessary to accept compressive loads. Welding of compression braces to the vertical support rods is not acceptable.

O. Provide reinforced clevis bolts when required.

P. The vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not acceptable.

Q. Post-Installed anchors shall be provided to meet seismic requirements.

R. Vertical pipe risers flexibly supported to accommodate thermal motion and/or pipe vibration shall be guided to maintain pipe stability and provide horizontal seismic restraint.

S. Seismic restraints shall be mechanically attached to the system. Looping restraints around the system is not acceptable.

T. Piping crossing building seismic or expansion joints, passing from building to building, or supported from different portions of the building shall be installed to allow differential support displacements without damaging the pipe, equipment connections, or support connections. Pipe offsets, loops, anchors, and guides shall be installed as required to provide required motion capability and limit motion of adjacent piping.

U. Water tanks shall be secured to their saddles by welding or proper concrete attachment, and those saddles shall be properly attached to the structure.

V. Brace all terminal units with water coils as required by the building code and provide flexible connection to the coil if bracing is required.

W. Independently brace duct mounted equipment (terminal units, in-line fans, etc.) and the associated suspended ductwork.

X. Do not brace a system to two different structures such as a wall and a ceiling.

Y. Provide appropriately sized openings in walls, floors, and ceilings for anticipated seismic movement. Provide fire seal systems in fire-rated walls.

Z. Positively attach all roof mounted equipment to roof curbs. Positively attach all roof curbs to building structure.

AA. Exposed seismic supports in occupied areas shall be guarded or covered to protect occupants.

BB. Coordinate seismic bracing of architecturally exposed ductwork with the Architect/Engineer.

3.2 SEISMIC RESTRAINT EXCLUSIONS

A. Refer to the applicable code sections and Authority Having Jurisdiction for allowable exclusions.

END OF SECTION 23 05 50

SECTION 23 05 53 - HVAC IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Identification of products installed under Division 23.

1.2 SUBMITTALS

A. Submit shop drawings under provisions of Section 23 05 00. Include list of items identified, wording, letter sizes, and color coding.

B. Include valve chart and schedule listing valve tag number, location, function, and valve manufacturer's name and model number.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. 3M

B. Bunting

C. Calpico

D. Craftmark

E. Emedco

F. Kolbi Industries

G. Seton

H. W.H. Brady

I. Marking Services.

2.2 MATERIALS

A. All pipe markers (purchased or stenciled) shall conform to ANSI A13.1. Marker lengths and letter sizes shall be at least the following:

OD of Pipe or Insulation	Marker Length	Size of Letters
Up to and including 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"

8" to 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

Plastic tags may be used for outside diameters under 3/4"

B. Aluminum Nameplates: Black enamel background with natural aluminum border and engraved letters furnished with two mounting holes and screws.

C. Brass Tags: Brass background with engraved black letters. Tag size minimum 1-1/2" square or 1-1/2" round.

D. Vinyl Pipe Markers: Colored vinyl with permanent pressure sensitive adhesive backing.

E. Ductwork Markers:

1. Ductwork systems containing hazardous materials shall be provided with minimum 2" x 4" ANSI Z535.2 biohazard warning labels with custom labeling describing hazard. Refer to Part 3 for system and label description.
2. Vinyl Markers: Colored vinyl with permanent pressure sensitive adhesive backing suitable for indoor and outdoor application.

F. Maintenance Access Doors:

1. Doors and roof hatches used to access equipment serving hazardous ductwork systems shall be provided with a minimum 4" x 6" ANSI Z5353.2 biohazard warning label. Label shall read "WARNING - BIOHAZARD. ONLY AUTHORIZED PERSONNEL BEYOND THIS POINT".
2. Coordinate location of warning label with Owner.

G. Ceiling Markers:

1. "Dot" Style:

a. The intent is for the ceiling labels to be inconspicuous but easy to find and read while standing underneath. The labels shall be located on the grid T-bar nearest the ceiling tile that can be removed to provide the best access to the serviceable side of equipment or to valves.

b. The marker shall be a self-adhesive color dot approximately 1/2” in diameter.

c. The equipment and accessories to be marked and dot color shall be coordinated with the Architect/Engineer and Owner.

1) Equipment and accessories to be marked:

a) Hydronic Valves
b) Fire Dampers
c) Fire/Smoke and Smoke Dampers
d) Fan Coil Units
e) Project Specific Item

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all products per manufacturer's recommendations.

B. Degrease and clean surfaces to receive adhesive for identification materials.

C. Valves:

1. All valves (except shutoff valves at equipment) shall have numbered tags.
2. Provide or replace numbered tags on all existing valves that are connected to new systems or that have been revised.
3. Provide all existing valves used to extend utilities to this project with numbered tags. Review tag numbering sequence with the Owner prior to ordering tags.
4. Secure tags with heavy duty key chain and brass "S" link or with mechanically fastened plastic straps.
5. Attach to handwheel or around valve stem. On lever operated valves, drill the lever to attach tags.
6. Number all tags and show the service of the pipe.
7. Provide one Plexiglas framed valve directory listing all valves, with respective tag numbers, uses and locations. Mount directory in location chosen by the Architect/Engineer.
8. Provide one 36" x 24" minimum Plexiglas framed piping schematic showing valve locations with respective tag numbers. Mount directory in location chosen by the Architect/Engineer.
9. Provide two sets of laminated 8-1/2" x 11" (letter size) copies of a valve directory listing all valves, with respective tag numbers, uses, and locations. The directory shall be reviewed by the Owner and Architect/Engineer prior to laminating final copies. Laminated copies shall have brass eyelet in at least one corner for easy hanging.

D. Pipe Markers:

1. Adhesive Backed Markers: Use Brady Style 1, 2, or 3 on pipes 3" diameter and larger. Use Brady Style 4, 6, or 8 on pipes under 3" diameter. Similar styles by other listed manufacturers are acceptable. Secure all markers at both ends with a wrap of pressure sensitive tape completely around the pipe.
2. Snap-on Markers: Use Seton "Setmark" on pipes up to 5-7/8" OD. Use Seton "Setmark" with nylon or Velcro ties for pipes 6" OD and over. Similar styles by other listed manufacturers are acceptable.

3. Apply markers and arrows in the following locations where clearly visible:

a. At each valve.
b. On both sides of walls that pipes penetrate.
c. At least every 20 feet along all pipes.
d. On each riser and each leg of each "T" joint.
e. At least once in every room and each story traversed.

E. Ductwork Markers:

1. Apply ductwork markers on ductwork systems containing hazardous materials in the following locations where clearly visible:

   a. On both sides of walls that ducts penetrate.
   b. At least every 20 feet along all ducts.
   c. On each riser and each leg of each branch connection.
   d. At least once in every room and each story traversed.
   e. At all ductwork access doors.
   f. At all fans and equipment serving ductwork system. Markers shall be clearly visible from the normal maintenance access path to the equipment. Coordinate placement location with Owner.

F. Equipment:

1. All equipment not easily identifiable such as controls, relays, gauges, etc.; and all equipment in an area remote from its function such as air handling units, exhaust fans, filters, reheat coils, dampers, etc.; shall have nameplates or plastic tags listing name, function, and drawing symbol. Do not label exposed equipment in public areas.
2. Fasten nameplates or plastic tags with stainless steel self-tapping screws or permanently bonding cement.
3. Mechanical equipment that is not covered by the U.S. National Appliance Energy Conservation Act (NAECA) of 1987 shall carry a permanent label installed by the manufacturer stating that the equipment complies with the requirements of ASHRAE 90.1.

G. Miscellaneous:

1. Attach self-adhesive vinyl labels at all duct access doors used to reset fusible links or actuators on fire, fire/smoke, or smoke dampers. Lettering shall be a minimum of 1/2" high. Labels shall indicate damper type.
2. Provide engraved plastic tags at all hydronic or steam system make-up water meters.

3.2 SCHEDULE

A. Pipes to be marked shall be labeled with text as follows, regardless of which method or material is used:

1. CONDENSATE DRAIN: White lettering; green background
2. NATURAL GAS: Black lettering; yellow background
3. REFRIGERANT LIQUID: White lettering; purple background
4. REFRIGERANT SUCTION: White lettering; purple background
5. REFRIGERANT HOT GAS: White lettering; purple background

END OF SECTION 23 05 53

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Testing, adjusting, and balancing of air systems.

B. Testing, adjusting, and balancing of heating systems.

C. Measurement of final operating condition of HVAC systems.

1.2 QUALITY ASSURANCE

A. Agency shall be a company specializing in the adjusting and balancing of systems specified in this section with minimum three years' experience. Perform work under supervision of AABC Certified Test and Balance Engineer, NEBB Certified Testing, Balancing and Adjusting Supervisor, SMARTA Certified Air and Hydronic Balancer, or TABB Certified Supervisor.

B. Work shall be performed in accordance with the requirements of the references listed at the start of this section.

1.3 REFERENCES

A. AABC - National Standards for Total System Balance, Seventh Edition.

B. ADC - Test Code for Grilles, Registers, and Diffusers.

C. AMCA - Publication 203-90; Field Performance Measurement of Fan Systems.

D. ASHRAE - 2019 HVAC Applications Handbook; Chapter 39, Testing, Adjusting and Balancing.

E. ASHRAE/ANSI - Standard 111-2008; Practices for Measurement, Testing, Adjusting and Balancing of Building HVAC&R Systems.

F. NEBB - Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems, Ninth Edition, 2019.

G. SMACNA - HVAC Systems; Testing, Adjusting and Balancing (latest edition).

H. TABB - International Standards for Environmental Systems Balance.

1.4 SUBMITTALS

A. Submit copies of report forms, balancing procedures, and the name and qualifications of testing and balancing agency for approval within 30 days after award of Contract.

B. Electronic Copies:

1. Submit a certified copy of test reports to the Architect/Engineer for approval. Electronic copies shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Copies that are not legible will be returned to the Contractor for resubmittal. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
2. Electronic file size shall be limited to a maximum of 10MB. Larger files shall be divided into files that are clearly labeled as "1 of 2", "2 of 2", etc.
3. All text shall be searchable.
4. Bookmarks shall be used. All bookmark titles shall be an active link to the index page and index tabs.

1.5 REPORT FORMS

A. Submit reports on AABC, SMACNA or NEBB forms. Use custom forms approved by the Architect/Engineer when needed to supply specified information.

B. Include in the final report a schematic drawing showing each system component, including balancing devices, for each system. Each drawing shall be included with the test reports required for that system. The schematic drawings shall identify all testing points and cross-reference these points to the report forms and procedures.

C. Refer to PART 4 for required reports.

1.6 WARRANTY/GUARANTEE

A. The TAB Contractor shall include an extended warranty of 90 days after owner receipt of a completed balancing report, during which time the Owner may request a recheck of terminals, or resetting of any outlet, coil, or device listed in the test report. This warranty shall provide a minimum of 24 manhours of onsite service time. If it is determined that the new test results are not within the design criteria, the balancer shall rebalance the system according to design criteria.

B. Warranty/Guarantee must meet one of the following programs: TABB International Quality Assurance Program, AABC National Project Performance Guarantee, NEBB's Conformance Certification.

1.7 SCHEDULING

A. Coordinate schedule with other trades. Provide a minimum of seven days' notice to all trades and the Architect/Engineer prior to performing each test.

B. Project will be constructed in phases. Provide balancing report after each phase is complete.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. All procedures must conform to a published standard listed in the References article of this section. All equipment shall be adjusted in accordance with the manufacturer's recommendations. Any system not listed in this specification but installed under the contract documents shall be balanced using a procedure from a published standard listed in the References article.

B. The Balancing Contractor shall incorporate all pertinent documented construction changes (e.g. submittals/shop drawings, change orders, RFIs, ASIs, etc.) and include in the balancing report.

C. Recorded data shall represent actual measured or observed conditions.

D. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing is complete, close probe holes and patch insulation with new materials as specified. Restore vapor barrier and finish as specified.

E. Permanently mark setting of valves, dampers, and other adjustment devices allowing for settings to be restored. Set and lock memory stops.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, plugging test holes, and restoring thermostats to specified settings.

G. The Balancing Contractor shall measure terminal air box air flow, and the TCC shall adjust DDC readout to match. Refer to Section 23 09 00 for additional information.

H. Installations with systems consisting of multiple components shall be balanced with all system components operating.

3.2 EXAMINATION

A. Before beginning work, verify that systems are complete and operable. Ensure the following:

1. General Equipment Requirements:

a. Equipment is safe to operate and in normal condition.
b. Equipment with moving parts is properly lubricated.
c. Temperature control systems are complete and operable.
d. Proper thermal overload protection is in place for electrical equipment.
e. Direction of rotation of all fans and pumps is correct.
f. Access doors are closed and end caps are in place.

2. Duct System Requirements:

    a. All filters are clean and in place. If required, install temporary media.
    b. Duct systems are clean and free of debris.
    c. Fire/smoke and manual volume dampers are in place, functional and open.
    d. Air outlets are installed and connected.
    e. Duct system leakage has been minimized.

3. Pipe System Requirements:

    a. Coil fins have been cleaned and combed.
    b. Hydronic systems have been cleaned, filled, and vented.
    c. Strainer screens are clean and in place.
    d. Shutoff, throttling and balancing valves are open.

B. Report any defects or deficiencies to Architect/Engineer.

C. Promptly report items that are abnormal or prevent proper balancing.

D. If, for design reasons, system cannot be properly balanced, report as soon as observed.

E. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to the Architect/Engineer for spot checks during testing.

B. Instruments shall be calibrated within six months of testing performed for project, or more recently if recommended by the instrument manufacturer.

3.4 INSTALLATION TOLERANCES

A. ± 10% of scheduled values:

1. Adjust air inlets and outlets to ± 10% of scheduled values.
2. Adjust piping systems to ±10% of design values.

B. ± 5% of scheduled values:

1. Adjust fume exhaust systems to ± 5% of scheduled values.
2. Adjust supply and exhaust air-handling systems for space pressurization to ± 5% of scheduled values, and to provide proper pressurization.

C. + 5% of scheduled values

1. Adjust outdoor air intakes to within + 5% of scheduled values.
2. Adjust exhaust air through energy recovery equipment to within +5% of scheduled values.

D. Adjust supply, return, and exhaust air-handling systems to +10% / -5% of scheduled values.

3.5 ADJUSTING

A. After adjustment, take measurements to verify balance has not been disrupted or that disruption has been rectified.

B. Once balancing of systems is complete, at least one damper or valve must be 100% open.

C. After testing, adjusting and balancing are complete, operate each system and randomly check measurements to verify system is operating as reported in the report. Document any discrepancies.

D. Contractor responsible for each motor shall also be responsible for replacement sheaves. Coordinate with contractor.

E. Contractor responsible for pump shall trim impeller to final duty point as instructed by this contractor on all pumps not driven by a VFD. Coordinate with contractor.

3.6 SUBMISSION OF REPORTS

A. Fill in test results on appropriate forms.

PART 4 - SYSTEMS TO BE TESTED, ADJUSTED AND BALANCED

4.1 GENERAL REQUIREMENTS

A. Title Page:

1. Project name.
2. Project location.
3. Project Architect.
4. Project Engineer (IMEG Corp.).
5. Project General Contractor.
6. TAB Company name, address, phone number.
7. TAB Supervisor's name and certification number.
8. TAB Supervisor's signature and date.
9. Report date.

B. Report Index

C. General Information:

1. Test conditions.
2. Nomenclature used throughout report.
3. Notable system characteristics/discrepancies from design.
4. Test standards followed.
5. Any deficiencies noted.
6. Quality assurance statement.

D. Instrument List:

1. Instrument.
2. Manufacturer, model, and serial number.
3. Range.
4. Calibration date.

4.2 AIR SYSTEMS

A. Duct Leakage Test:

1. Air system and fan.
2. Leakage class.
3. Test pressure.
4. Construction pressure.
5. Flow rate (cfm): specified and actual.
6. Leakage (refer to Section 23 31 00 in the specifications): specified and actual.
7. Statement that fire dampers, reheat coils and other accessories were included in the test.
8. Pass or Fail.
9. Test performed by.
10. Test witnessed by.

B. Air Moving Equipment:

1. General Requirements:

a. Drawing symbol.
b. Location.
c. Manufacturer, model, arrangement, class, discharge.
d. Fan RPM.
e. Multiple RPM fan curve with operating point marked. (Obtain from equipment supplier).
f. Final frequency of motor at maximum flow rate (on fans driven by VFD).

2. Flow Rate:

a. Supply flow rate (cfm): specified and actual.
b. Return flow rate (cfm): specified and actual.
c. Outside flow rate (cfm): specified and actual.
d. Exhaust flow rate (cfm): specified and actual.

3. Pressure Drop and Pressure:

a. Filter pressure drop: specified and actual.
b. Total static pressure: specified and actual. (Indicate if across fan or external to unit).
c. Inlet pressure.
d. Discharge pressure.

C. Fan Data:

1. Drawing symbol.
2. Location.
3. Manufacturer and model.
4. Flow rate (cfm): specified and actual.
5. Total static pressure: specified and actual. (Indicate measurement locations).
6. Inlet pressure.
7. Discharge pressure.
8. Fan RPM.

D. Electric Motors:

1. Drawing symbol of equipment served.
2. Manufacturer, Model, Frame.
3. Nameplate: HP, phase, service factor, RPM, operating amps, efficiency.
4. Measured: Amps in each phase.

E. Duct Traverse:

1. System zone/branch/location.
2. Duct size.
3. Free area.
4. Velocity: specified and actual.
5. Flow rate (cfm): specified and actual.
6. Duct static pressure.
7. Air temperature.
8. Air correction factor.

F. Air Terminal (Inlet or Outlet):

1. Drawing symbol.
2. Room number/location.
3. Terminal type and size.
4. Velocity: specified and actual.
5. Flow rate (cfm): specified and actual.
6. Percent of design flow rate.

G. Air Terminal Unit (Terminal Air Box) Data:

1. General Requirements:

    a. Drawing symbol.
    b. Location.
    c. Manufacturer and model.
    d. Size.
    e. Type: constant, variable, single, dual duct.

2. Flow Rate:

    a. Cooling maximum flow rate (cfm): specified and actual.

b. Heating maximum flow rate (cfm): specified and actual.
c. Minimum flow rate (cfm): specified and actual.
d. Water flow rate (gpm): specified and actual with system performance adjusted as follows:

1) Adjust heating water system pump to maintain maximum system differential pressure.
2) Set calibrated balance valve fully open.
3) Command terminal air box control valve to fully open.
4) Measure heating coil flow using calibrated balance valve.
5) Note: Commanding terminal air box control valve to be fully open shall be done on a valve-by-valve basis. Do not command all control valves to be fully open at the same time, as the heating water system may not have sufficient capacity.
6) Note: After Balancing of all terminal air boxes is complete, release the heating water pump to automatically reset the system DP based on control valve position per sequence of operation requirements.

3. Temperature:

a. Entering air temperature: specified and actual.
b. Leaving air temperature (in minimum airflow/heating mode): specified and actual.
c. Entering water temperature: specified and actual.
d. Leaving water temperature: specified and actual.

4. Pressure Drop and Pressure:

a. Inlet static pressure during testing cooling maximum airflow rate (maximum and minimum).
b. Water pressure drop: specified and actual.

H. Air Flow Measuring Station:

1. Drawing symbol.
2. Service.
3. Location.
4. Manufacturer and model.
5. Size.
6. Flow rate (cfm): specified and actual.
7. Pressure drop: specified and actual.

4.3 HEATING SYSTEMS

A. Terminal Heat Transfer Units:

1. General Requirement:

a. Drawing symbol.
b. Location.
c. Manufacturer and model.
d. Include air data only for forced air units.

2. Flow Rate:

    a. Flow rate (cfm): specified and actual.
    b. Water flow rate (cfm): specified and actual.

3. Temperature:

    a. Entering air temperature: specified and actual.
    b. Leaving air temperature: specified and actual.
    c. Entering water temperature: specified and actual.
    d. Leaving water temperature: specified and actual.

4. Energy:

    a. Air Btuh (cfm x temperature rise x 1.09).
    b. Water Btuh (gpm x temperature drop x 500). Repeat tests if not within 10% of air Btuh.

END OF SECTION 23 05 93

SECTION 23 07 13 - DUCTWORK INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Ductwork Insulation.

B. Insulation Jackets.

1.2 QUALITY ASSURANCE

A. Applicator: Company specializing in ductwork insulation application with five years minimum experience. When requested, installer shall submit manufacturer's certificate indicating qualifications.

B. Materials:

1. Listed and labeled for flame spread/smoke developed rating of no more than 25/50 when tested per ASTM E84 or UL 723 as required by code.
2. Fungal Resistance: No growth when tested in accordance with ASTM G21 (antifungal test).
3. Rated velocity on coated air side for air erosion in accordance with UL 181 at 5,000 fpm minimum.
4. UL listed in Category HNKT.

C. Adhesives: UL listed, meeting NFPA 90A/90B requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Type A: Flexible Fiberglass - Outside Wrap; ANSI/ASTM C553; commercial grade; 0.28 / 0.26 (Out-Of-Package/Installed-Compressed 25%) maximum 'K' value at 75°F; foil scrim Kraft facing, 1.0 lb./cu. ft. density. Submit both "Out of Package" and "Installed-Compressed 25%" K and R-values.

B. Type B: Semi-rigid Fiberglass Board Wrap - Outside Application; ANSI/ASTM C612, Class 1; 0.25 maximum 'K' value at 75°F; foil scrim Kraft facing, 3 lb./cu. ft. density.

C. Type C: Flexible Fiberglass Liner; ANSI/ASTM C1071; 0.28 maximum 'K' value at 75°F; 1.5 lb/cu ft minimum density; coated air side for 5000 fpm air velocity.

D. Type E: Double wall ductwork insulation; fiberglass; 0.27 maximum 'K' value at 75°F mean temperature; 1.5 lb/cu ft density.

E. Type I: Flexible Elastomeric Liner; EPDM (NBR/PVC Blend is not permitted) Elastomeric cellular foam sheet; ANSI/ASTM C534; 0.25 maximum 'K' value at 75°F; listed and labeled at no more than 25/50 when tested per ASTM E84 or UL 723 as required by code; coated air side for 5000 fpm air velocity.

		R-VALUE PER THICKNESS							
	THICKNESS	0.5	1	1.5	2	2.5	3	4	5
TYPE	K-FACTOR	R-VALUE							
Flexible Fiberglass Outside Wrap	0.28			5.4	7.1	8.9	10.7	14.3	17.9
Semi-Rigid Fiberglass Board Wrap	0.25			6.0	8.0	10.0	12.0	16.0	20.0
Flexible Fiberglass Liner	0.28	1.8	3.6	5.4	7.1	8.9	10.7	14.3	17.9
Rigid fiberglass liner	0.23		4.3	6.5	8.7	10.9	13.0	17.4	21.7
Double Wall Ductwork	0.27		3.7	5.6	7.4	9.3	11.1	14.8	18.5
Flexible High Temp Rigid Preformed Fiberglass Acoustical Liner	0.23		4.3	6.5	8.7	10.9	13.0	17.4	21.7

2.2 JACKETS

A. Vapor Barrier Jackets: Kraft reinforced foil scrim vapor barrier with self-sealing adhesive joints. Beach puncture resistance ratio of at least 25 units. Tensile strength: 35 psi minimum. Single, self-seal acrylic adhesive on longitudinal jacket laps and butt strips.

2.3 JACKET COVERINGS

A. Stainless Steel Jackets: Type 304 stainless steel; 0.010" thick; smooth finish with Z edge seams and stainless steel bands for outdoor use.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install materials in accordance with manufacturer's instructions, codes, and industry standards.

B. Install materials after ductwork has been tested.

C. Clean surfaces for adhesives.

D. Provide insulation with vapor barrier when air conveyed may be below ambient temperature.

E. Exterior Duct Wrap - Flexible, Type A:

1. Apply with edges tightly butted.
2. Cut slightly longer than perimeter of duct to insure full thickness at corners. Do not wrap excessively tight.
3. Seal joints with adhesive backed tape.
4. Apply so insulation conforms uniformly and firmly to duct.
5. Seal all penetrations of the vapor barrier by strap hangers or slip cable hangers with adhesive backed tape.
6. Provide high-density insulation inserts on rectangular ducts at trapeze duct hangers to prevent crushing of insulation. Provide high-density insulation inserts with clamp-on round ducts requiring two (2) rods or straps to prevent crushing of insulation. Maintain continuous vapor barrier through the hanger.
7. Tape all joints with Royal Tapes #RT 350 (216-439-7229), Venture Tape 1525CW, or Compac Type FSK. No substitutions will be accepted without written permission from the Architect/Engineer.
8. Press tape tightly to the duct covering with a squeegee for a tight continuous seal. Fish mouths and loose tape edges are not acceptable.
9. Staples may be used, but must be covered with tape.
10. Vapor barrier must be continuous.
11. Mechanically fasten on 12" centers at bottom of ducts over 24" wide and on all sides of vertical ducts.

F. Semi Rigid Fiberglass Board Wrap - Type B (Indoor Use):

1. Impale on pins welded to the duct and secured with speed clips. Clip pins off close to speed clips.
2. Space pins as needed to hold insulation firmly against duct, but not less than one pin per square foot. Pins must be long enough to avoid compressing the insulation.
3. Seal all joints and speed clips with glass fabric set in adhesive or a 3" wide strip of Royal Tapes #RT 350 (216-439-7229), Venture Tape 1525CW, or Compac Type FSK facing tape.
4. For small areas, secure insulation with adhesive over the entire surface of the duct. Use adhesive in addition to pins as needed to prevent sagging on horizontal surfaces.

G. Semi Rigid Fiberglass Board Wrap - Type B (Outdoor Use):

1. Impale on pins welded to the duct and secured with speed clips. Clip pins off close to speed clips.
2. Space pins as required to hold insulation firmly against duct, but not less than one pin per square foot. Pins must be long enough to avoid compressing the insulation.
3. Seal all joints and speed clips with glass fabric set in adhesive or a 3" wide strip of the same facing tape with adhesive.
4. For small areas, secure insulation with adhesive over the entire surface of the duct. Use adhesive in addition to pins as needed to prevent sagging on horizontal surfaces.
5. Install vapor barrier jacket. Cover with stainless steel jacket covering with seams on the bottom of horizontal ductwork.

6. Seal all butt joints with metal draw bands screwed to jacket and filled with sealant. Seal all joints watertight.
7. Provide positive slope on top of all horizontal surfaces to prevent ponding of water.

H. Interior Insulation - Flexible Duct Liner, Type C:

1. Observation of Duct Lining:

    a. After installation of ductwork, Architect/Engineer may select random observation points in each system.

        1) At each observation point, cut and remove an 18" x 18" section of ductwork and liner for verification of installation.
        2) Random observation points based on one opening per 75 lineal ft. of total duct run.

    b. When any of the observation points shows non-compliance, additional points will be designated by the Architect/Engineer, and observation repeated.
    c. If 20% of points observed do not comply, remove and replace all lined ducts and repeat tests. Where replacement is not required, correct all non-compliances.
    d. At end of observation, repair all duct lining and observation holes by installing standard, insulated, hinged access doors per Section 23 33 00.
    e. Paint or finish to match adjacent duct surfaces.

2. Impale on spindle anchors welded or mechanically fastened to the duct. Adhesive or glue fastened anchors are not acceptable. Maximum anchor spacing per SMACNA Duct Construction Standards or manufacturer's recommendations, whichever is more restrictive. Locate pins less than 3" from corners and at intervals not over 6" around the perimeter at leading and trailing edges. Locate pins within 3" of transverse joints and at intervals not over 16" long the length of the duct. Pins must be long enough to prevent compressing the insulation.
3. In addition to anchors, secure liner with UL listed adhesive covering over 90% of the duct surface.
4. Install per the latest edition of the SMACNA Manual.
5. Leading edges shall be covered as follows:

    a. For duct velocities below 3000 fpm, coat leading edges with adhesive. Neatly butt liner without gaps at transverse joints. Cut liner flush with end of the duct section for tight joints with no exposed duct. If adhesive is shop installed, field apply additional adhesive to the end of each duct section for complete adhesion of the liner. Protect edges from dirt and debris.
    b. For duct velocities above 3000 fpm, cover leading edges with metal nosing. Use nosing on upstream edges of each section of duct. If the duct can be installed in either direction, provide nosing on each end or clearly mark the duct to allow visual verification after installation. Verify duct velocities based on the scheduled air flow rates and determine where metal nosing is required.

c. Install metal nosing in the following locations (regardless of velocity):

1) The first three fittings downstream of all fans.
2) At all duct liner interruptions. This includes fire dampers, access doors, branch connections, and all other locations where the edge of the liner is exposed.
3) Trailing edges of transverse joints do not require metal nosings.

6. Overlap liner at longitudinal joints. Make longitudinal joints at corners of the duct unless the duct size does not allow this. Coat longitudinal joints with adhesive at velocities over 2500 fpm.
7. Seal all damaged duct liner with adhesive and glass cloth. Do not damage duct liner surface coatings.
8. Duct dimensions given are net inside dimensions. Increase sheet metal to allow for insulation thickness.

I. Double-Wall Ductwork Insulation - Type E:

1. Install insulation per manufacturer's recommendations.
2. Duct dimensions given are net inside dimensions of inner wall.

J. Exterior Duct Wrap - Type I:

1. On ducts with any sides having a dimension 20" and greater: Impale insulation on spindle anchors welded or mechanically fastened to the duct and secured with speed clips. Clip pins off close to speed clips. Adhesive or glue fastened anchors are not acceptable. Maximum anchor spacing per SMACNA Duct Construction Standards or manufacturer's recommendations, whichever is more restrictive. Locate pins within 4" from edges and at intervals not over 16" in all directions. Pins shall be long enough to prevent compressing the insulation.

K. Continue insulation with vapor barrier through penetrations unless code prohibits.

L. Provide 2" wide, 24" high, 26 gauge, galvanized sheet metal corner protection angles for all externally insulated ductwork extending to a floor or curb.

3.2 SCHEDULE

A. Refer to Section 23 31 00 for scheduling of insulation.

END OF SECTION 23 07 13

SECTION 23 09 05 - SMALL EQUIPMENT CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Complete System of Automatic Controls.

B. Control Devices, Components, Wiring and Material.

C. Instructions for Owners.

D. Remodeling.

1.2 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five years' experience.

B. TCC: Company specializing in the work of this section with minimum three years temperature control experience.

C. Technician: Minimum three years' experience installing commercial temperature control systems.

D. TCCs are limited to firms regularly employing a minimum of one full-time temperature control technician within 100 miles of the job site.

E. Control low (24V) and control line (120V) voltage wiring, conduit, and related switches and relays required for the automatic control and/or interlock of motors and equipment, including final connection, are to be furnished and installed under this section.

1.3 SUBMITTALS

A. Equipment Coordination:

1. The Mechanical Contractor shall obtain approved equipment submittals from other contractors to determine equipment wiring connections, to choose appropriate controllers, and to provide programming.
2. Coordinate the control interface of all equipment with the equipment manufacturers prior to submittal submission.

B. Shop Drawings:

1. Submit shop drawings per Section 23 05 00. In addition, submit an electronic copy of the shop drawings in Adobe Acrobat (.pdf) format to the Owner for review.
2. Cross-reference **all** control components and point names in a single table located at the beginning of the submittal with the **identical** nomenclature used in this section.

3. Submittal shall also include a trunk cable schematic diagram depicting operator workstations, control panel locations and a description of the communication type, media and protocol.
4. System Architecture: Provide riser diagrams of wiring between central control unit and all control panels. This shall include specific protocols associated with each level within the architecture. Identify all interface equipment between CPU and control panels. The architecture shall include interface requirements with other systems including, but not limited to, security systems, lighting control, fire alarm, elevator status, and power monitoring system.
5. Diagrams shall include:

    a. Wiring diagrams and layouts for each control panel showing all termination numbers.
    b. Schematic diagrams for all control, communication, and power wiring. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers' model numbers and functions. Show all interface wiring to the control system.
    c. Identification of all control components connected to emergency power.
    d. Schematic diagrams for all field sensors and controllers.
    e. A schematic diagram of each controlled system. The schematics shall have all control points labeled. The schematics shall graphically show the location of all control elements in the system.
    f. A schematic wiring diagram for each controlled system. Each schematic shall have all elements labeled. Where a control element is the same as that shown on the control system schematic, label it with the same name. Label all terminals.
    g. A tabular instrumentation list for each controlled system. The table shall show element name, type of device, manufacturer, model number and product data sheet number.
    h. All installation details and any other details required to demonstrate that the system will function properly.
    i. All interface requirements with other systems.

6. The network infrastructure shall conform to the published guidelines for wire type, length, number of nodes per channel, termination, and other relevant wiring and infrastructure criteria as published. The number of nodes per channel shall be no more than 80% of the defined segment (logical or physical) limit in order to provide future system enhancement with minimal infrastructure modifications.
7. Sequences: Submit a complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system. **The wording of the control sequences in the submittal shall match verbatim that included in the construction documents to ensure there are no sequence deviations from that intended by the Architect/Engineer. Clearly highlight any deviations from the specified sequences on the submittals.**

8. Points List Schedule: Submit a complete points list of all points to be connected to the TCS and FMCS. The points list for each system controller shall include both inputs and outputs (I/O), point number, the controlled device associated with the I/O point, the location of the I/O device, and reference drawings. Where a control point is the same as that shown on the control system schematic, label it with the same name. Points list shall specifically identify alarms, trends, event history, archive, totalization, graphic points, and all mapped points from other systems (security systems, lighting control, fire alarm, etc.). Provide points lists, point naming convention, and factory support information for systems provided and integrated into the FMCS.
9. Damper Schedule: Schedule shall include a separate line for each damper and a column for each of the damper attributes:

    a. Damper Identification Tag.
    b. Location.
    c. Damper Type.
    d. Damper Size.
    e. Duct Size.
    f. Arrangement.
    g. Blade Type.
    h. Velocity.
    i. Pressure Drop.
    j. Fail Position.
    k. Actuator Identification Tag.
    l. Actuator Type.
    m. Mounting.

10. Product Data Sheets: Required for each component that includes: unique identification tag that is consistent throughout the submittal, manufacturer's description, technical data, performance curves, installation/maintenance instructions, and other relevant items. When manufacturer's literature applies to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is to cover. General catalogs shall not be accepted as cutsheets to fulfill submittal requirements.
11. Provide documentation of submitted products that have been tested and listed by the BACnet Testing Laboratory (BTL) or provide a letter on the manufacturer's company letterhead indicating the anticipated date by which testing is expected to be completed. If, for any reason, BTL testing and listing has not been completed, a written commitment to upgrade installed controls to a version that meets BTL testing and listing requirements if problems are found during BTL testing is required.
12. Control System Demonstration and Acceptance: Provide a description of the proposed process, along with all reports and checklists to be used.
13. Clearly identify work by others in the submittal.
14. Quantities of items submitted may be reviewed but are the responsibility of the Contractor to verify.

C. Operation and Maintenance Manual:

1. In addition to the requirements of Section 23 05 00, submit an electronic copy of the O&M manuals in PDF format.
2. Provide three complete sets of manuals.
3. Each O&M manual shall include:

    a. Table of contents with indexed tabs dividing information as outlined below.
    b. Definitions: List of all abbreviations and technical terms with definitions.
    c. Warranty Contacts: Names, addresses, and 24-hour telephone numbers of contractors installing equipment and controls and service representatives of each.
    d. Licenses, Guarantees, and Warranties: Provide documentation for all equipment and systems.
    e. System Components: Alphabetical list of all system components, with the name, address, and telephone number of the vendor.
    f. Operating Procedures: Include procedures for operating the control systems; logging on/off; enabling, assigning, and reporting alarms; generating reports; collection, displaying, and archiving of trended data; overriding computer control; event scheduling; backing up software and data files; and changing setpoints and other variables.
    g. Programming: Description of the programming language (including syntax), statement descriptions (including algorithms and calculations used), point database creation and modification, program creation and modification, and use of the editor.
    h. Engineering, Installation, and Maintenance: Explain how to design and install new points, panels, and other hardware; recommended preventive maintenance procedures for all system components, including a schedule of tasks (inspection, cleaning, calibration, etc.), time between tasks, and task descriptions; how to debug hardware problems; and how to repair or replace hardware. A list of recommended spare parts.
    i. Original Software: Complete original issue CDs for all software provided, including operating systems, programming language, operator workstation software, and graphics software. In lieu of CDs, provide login information and access to a web application where the current information can be downloaded at no additional cost.

D. Training Manual:

1. Provide a course outline and training manuals for each training class. Provide login information and access to a web application where the current training manuals can be downloaded at no additional cost.

E. Record Documents:

1. Submit record documentation per Section 23 05 00.
2. Provide a complete set of "as-built" drawings and application software on CDs. Provide drawings as AutoCAD™ or Visio™ compatible files. Provide two copies of the "as-built" drawings with revisions clearly indicated in addition to the documents on compact disk. Provide all product data sheets in PDF format.

3. Submit two hard copies and one electronic copy of as-built versions of the shop drawings, including product data and record drawings with revisions clearly indicated. Provide floor plans showing actual locations of control components including panels, thermostats, sensors, and hardware.
4. Provide all completed testing and commissioning reports and checklists.
5. Submit printouts of all graphic screens with current values (temperatures, pressures, etc.) to the A/E verifying completion and proper operation of all points.

1.4 DELIVERY, STORAGE AND HANDLING

A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

B. Factory-Mounted Components: Where control devices specified in this section are indicated to be factory mounted on equipment, arrange for shipping control devices to unit manufacturer.

1.5 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Automatic Dampers.

1.6 AGENCY AND CODE APPROVALS

A. All products shall have the following agency approvals. Provide verification that the approvals exist for all submitted products with the submittal package.

1. UL-916; Energy Management Systems.
2. C-UL listed to Canadian Standards Association C22.2 No. 205-M1983 "Signal Equipment."
3. EMC Directive 89/336/EEC (European CE Mark).
4. FCC, Part 15, Subpart J, Class A Computing Devices.

1.7 ACRONYMS

A. Acronyms used in this specification are as follows:

1. B-AAC - BACnet Advanced Application Controller
2. B-ASC - BACnet Application Specific Controller
3. BTL - BACnet Testing Laboratories
4. DDC - Direct Digital Controls
5. FMCS - Facility Management and Control System
6. GUI - Graphic User Interface
7. IBC - Interoperable BACnet Controller
8. IDC - Interoperable Digital Controller
9. LAN - Local Area Network
10. NAC - Network Area Controller
11. ODBC - Open DataBase Connectivity
12. WNAC - Wireless Network Area Controller
13. OOT - Object Oriented Technology
14. OPC - Open Connectivity via Open Standards

15. PICS - Product Interoperability Compliance Statement
16. TCC - Temperature Control Contractor
17. TCS - Temperature Control System
18. WAN - Wide Area Network
19. WBI - Web Browser Interface

1.8 SUMMARY

A. Provide new standalone FMCS for this project.

B. Extend Existing System:

1. Extend the existing FMCS for this project.
2. All controllers and accessories shall interface with the existing FMCS.

C. Owner Furnished System:

1. Owner will furnish FMCS panels, sensors, etc. installed under this contract. Reference control diagrams issued with these documents for required monitoring by this system.
2. The Temperature Control Contractor (TCC) shall receive, store, protect and install the FMCS products supplied by the Owner. These will consist of FMCS panels and subassemblies, prewired outboard gear cabinets (prewired to terminal strips), and those input sensors identified in the project points lists. All work to install this equipment, as well as the necessary piping and wiring, are the responsibility of the TCC. The TCC shall also receive control system drawings provided by the FMCS system manufacturer. The TCC shall create integrated system drawings showing all work provided by the TCC and by the Owner. The Owner will provide a completely functioning operating software package for each FMCS Panel. The Owner will employ the manufacturer to commission the FMCS system hardware. The TCC shall provide manpower at the jobsite whenever the Owner's FMCS supplier is commissioning the system.

D. TCC shall furnish all labor, materials, equipment, and service necessary for a complete and operating Temperature Control System (TCS) and Facility Management and Control System (FMCS) using direct digital controls as shown on the drawings and as described herein.

E. All labor, material, equipment and software not specifically referred to herein or on the plans that is required to meet the intent of this specification shall be provided without additional cost to the Owner.

F. The Owner shall be the named license holder of all software associated with any and all incremental work on the project.

G. Provide Critical Environment Control System (refer to Section 23 09 20).

1.9 SYSTEM DESCRIPTION

A. The entire TCS shall be comprised of a network of interoperable, standalone digital controllers communicating via the following protocol to an NAC. Temperature Control System products shall be as specified below.

B. The FMCS shall include network area controller or controllers (NAC) within each facility. The NAC shall connect to the Owner's local or wide area network, depending on configuration. Provide access to the system, either locally in each building or remotely from a central site or sites, through standard web browsers, via the Internet, and/or via local area network.

C. The FMCS will include all related programming, with a fully operational web-based management system using a cloud server program and including a network of commercial internet programmable thermostats that use IEEE 802.15.4 mesh wireless communication protocol to reach a wireless network area controller (WNAC). The WNAC shall connect to the Owner's local or wide area network, depending on configuration, over a TCP/IP connection. Access and control of the FMCS is via a web-based management tool that resides on a cloud server and must be accessible either locally or remotely via the Internet.

D. Provide materials and labor necessary to connect factory-supplied control components.

E. Provide central and remote hardware, software, and interconnecting wire and conduit where required.

F. The FMCS shall include automated alarming software capable of calling email-compatible cellular telephones and pagers. The email alarm paging system shall be able to segregate users, time schedules, and equipment and be capable of being programmed by the Owner.

G. For each touchscreen display, mobile application, and web user interface provided, furnish one legal copy of all software tools, configuration tools, management tools, and utilities used during system commissioning and installation. All tools shall be readily available in the market. Contractor shall convey to the Owner all software tools and their legal licenses at project closeout.

1.10 SOFTWARE LICENSE AGREEMENT

A. The Owner shall be the named license holder of all software and applications associated with any and all incremental work on the project(s). In addition, the Owner shall receive ownership of all job-specific configuration documentation, data files, configuration tools, and application-level software developed for the project. This shall include, but is not limited to, all custom, job-specific software code and documentation for all configuration and programming that is generated for a given project and/or configured for use with the NAC, FMCS Server(s), and any related LAN/WAN/intranet and/or Internet connected routers and devices. Provide the Owner with all required IDs and passwords for access to any component or software program. The Owner shall determine which organizations shall be named in the SI organization ID (**"orgid"**) of all software licenses. Owner shall be free to direct the modification of the **"orgid"** in any software license, regardless of supplier.

1.11 JOB CONDITIONS

A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It is this Contractor's responsibility to check the Contract Documents for possible conflicts between the Work of this section and that of other crafts in equipment location; pipe, duct and conduit runs; electrical outlets and fixtures; air diffusers; and structural and architectural features.

1.12 WARRANTY

A. Refer to Section 23 05 00 for warranty requirements.

B. Within the warranty period, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by this Contractor at no expense to the Owner.

C. Warranty requirements include furnishing and installing all FMCS software upgrades issued by the manufacturer during the one-year warranty period.

D. Update all software and back-ups during warranty period and all user documentation on the Owner's archived software disks.

1.13 WARRANTY ACCESS

A. The Owner shall grant to this Contractor reasonable access to the TCS and FMCS during the warranty period.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS (BACnet Protocol)

A. Carrier: iVU

B. Lennox: iHarmony

C. Honeywell: LCBS

D. Johnson Controls: Verasys

E. Trane: Concierge

2.2 SYSTEM ARCHITECTURE

A. General:

1. The Temperature Control System (TCS) and Facility Management Control System (FMCS) shall consist of a network of interoperable, standalone digital controllers, touchscreen display, mobile application, web user interface, network devices, dampers, sensors, and other devices as specified herein.
2. The installed system shall provide secure password or PIN access to all features, functions and data contained in the overall FMCS.

B. Open, Interoperable, Integrated Architectures:

1. All components and controllers supplied under this Division shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data are not acceptable.
2. The supplied system must be able to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. Systems requiring proprietary user interface programs are not acceptable.

2.3 NETWORKS

A. The local area network (LAN) shall be a minimum 100 megabits/sec Ethernet network supporting BACnet. Provide support for multiple network area controllers (NACs).

B. Local area network minimum physical and media access requirements:

1. Ethernet; IEEE Standard 802.3.
2. Cable; 100 Base-T, UTP-8 wire, Category 6.
3. Minimum throughput; 100 Mbps.

C. Communication conduits shall not be installed closer than six feet from 110VAC or higher transformers or run parallel within six feet of electrical high-power cables. Route the cable as far from interference generating devices as possible. Where communication wire must cross 110VAC or higher wire, it must do so at right angles.

D. Ground all shields (earth ground) at one point only to eliminate ground loops. Provide all shield grounding at the controller location, with the shield at the sensor/device end of the applicable wire being left long and "safed" off in an appropriate manner.

E. There shall be no power wiring more than 30 VAC rms run in conduit with communications wiring. In cases where signal wiring is run in conduit with communication wiring, run all communication wiring and signal wiring using separate twisted pairs (24awg) in accordance with the manufacturer's wiring practices.

2.4 REMOTE NETWORK ACCESS

A. For local area network installations, provide access to the LAN from a remote location via the Internet. The Owner shall provide a connection to the Internet to enable this access via high speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line, T1 line or via the customer's intranet to a corporate server providing access to an internet service provider (ISP). Customer agrees to pay monthly access charges for connection and ISP.

B. The controls manufacturer shall provide secure remote access to the FMCS.

1. Secure remote access to the FMCS shall be available anywhere, anytime, using a compatible client device (PC/tablet/phone)
2. Secure remote access to the FMCS shall be maintained by controls manufacturer.
3. Secure remote access to the FMCS shall not require additional software to be installed on the client device (e.g., VPN client).
4. Secure remote access to the FMCS shall not require any inbound ports on a firewall to be "exposed" or "forwarded".

2.5 NETWORK AREA CONTROLLER (NAC)

A. The TCC shall supply one or more network area controllers (NAC) as part of this contract. Number of NACs required depends on the type and quantity of devices provided under Divisions 23 and 26. The TCC shall determine the quantity and type of devices.

B. Each system controller shall perform communications to a network of custom application and application specific controllers using BACnet/MSTP (RS485) as defined by the BACnet standard. Each NAC shall provide the interface between the LAN or WAN and the field control devices, and shall provide global supervisory control functions over the control devices connected to the NAC. It shall execute application control programs to provide:

1. Calendar functions.
2. Scheduling.
3. Alarm monitoring and routing.
4. Time synchronization.
5. Integration of all controller data.
6. Network management functions.

C. The network area controller shall provide the following hardware features as a minimum:

1. One Ethernet Port - 10/100 Mbps.
2. One RS-485 port.

3. Battery backup.
4. Flash memory for long-term data backup. (If battery backup or flash memory is not supplied, the controller shall contain a hard disk with at least 1 gigabyte storage capacity.)
5. The NAC must be capable of operation over a temperature range of 32°F to 122°F.
6. The NAC must be capable of withstanding storage temperatures of between 0°F and 158°F.
7. The NAC must be capable of operation over a humidity range of 5% RH to 95% RH, non-condensing.

D. The NAC shall support standard Web browser access via the Internet or an intranet.

E. Event Alarm Notification and Actions:

1. The NAC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
2. The NAC shall be able to route any alarm condition to any defined user location whether connected to a LAN, remote via dial-up telephone connection, or WAN.
3. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including, but not limited to:

    a. Alarm
    b. Normal

4. Provide for the creation of a minimum of eight alarm classes with different routing and acknowledgement properties, e.g., security, HVAC, fire, etc.
5. Provide timed (scheduled) routing of alarms by class, object, group, or node.
6. Provide alarm generation from binary object "runtime" and/or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.

F. Treat control equipment and network failures as alarms and annunciated.

G. Annunciate alarms in any of the following manners as defined by the user:

1. Touchscreen message.
2. Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:

    a. Day of week.
    b. Time of day.
    c. Recipient.

3. Pagers via paging services that initiate a page on receipt of email message.
4. Graphic with flashing alarm object(s).

H. The FMCS shall record the following for each alarm:

1. Time and date.

2. Location (building, floor, zone, office number, etc.).
3. Equipment tag.
4. Acknowledge time, date, and user who issued acknowledgement.
5. Number of occurrences since last acknowledgement.

I. Give defined users proper access to acknowledge any alarm.

J. A log of all alarms shall be maintained by the NAC and/or a server (if configured in the system) and shall be available for review by the user.

2.6 WIRELESS NETWORK AREA CONTROLLER (WNAC)

A. The TCC shall supply one or more wireless network area controllers (WNAC) as part of this contract. Number of NACs required depends on the type and quantity of devices provided under Divisions 23 and 26. The TCC shall determine the quantity and type of devices.

B. Each system controller shall perform communications to a network of custom application and application specific controllers using ANSI/ASHRAE Standard 135-2016 (BACnet®/ZigBee®). It shall execute application control programs to provide:

1. Calendar functions.
2. Scheduling.
3. Alarm monitoring and routing.
4. Time synchronization.
5. Integration of all controller data.
6. Network management functions.

C. The WNAC shall be capable of similar performance to a wired, equally quantified network by responding to controls requests within 10% timing comparison to provide a similar user experience for facility managers and occupants. The WNAC shall support standard web browser access via the Internet or an intranet.

D. The WNAC shall be capable of similar performance to a wired, equally quantified network by responding to controls requests within 10% timing comparison to provide a similar user experience for facility managers and occupants.

E. The WNAC shall be secured using Advanced Encryption Standard AES-128 (FIPS Pub 197) and HMAC (FIPS Pub 198). A trust center will create a randomly generated 128-bit network security key for each ZigBee network.

F. The WNAC shall use IEEE 802.15.4 radios to minimize risk of interference and maximize battery life, reliability, and range.

G. Indoor design range for wireless transmission and receiving shall be a minimum of 200 feet; open range shall be 2500 feet with less than 2% packet error rate to minimize the need for repeaters and to optimize network reliability. TCC shall field test locations identified on the drawings for connectivity prior to installing components. Report findings to the Mechanical Engineer along with proposed recommendations for device relocation.

H. The WNAC shall employ two-way communications to maintain robust communication, self-healing, and redundant mesh networking, and to optimize the wireless network reliability.

I. The WNAC shall be capable of many-to-one sensors per controller to support averaging, monitoring, and multiple zone applications.

J. The WNAC shall include FCC CFR47 - Radio Frequency Devices - Section 15.247 & Subpart E certifications.

K. WNAC functionality for equipment with variable speed fans shall include the following:

1. The WNAC shall provide an air systems application program that coordinates rooftop units (RTU) and variable air volume terminal equipment.
2. Start up and shut down the air handler safely. Ensure the VAV boxes are open sufficiently when the air handler is running to prevent damage to the ductwork and VAV boxes due to high air pressure.
3. Calibrate VAV boxes to ensure proper air damper/actuator operation.
4. Fan Pressure Optimization (ASHRAE 90.1): Minimize energy usage by controlling system static pressure to the lowest level while maintaining zone airflow requirements. System static pressure controlled to keep the "most open" zone damper between 65% and 75% open.
5. The fan pressure optimization application shall have the ability to identify and display the discharge air setpoint of the air handler and the VAV box that serves the critical zone (i.e., the zone with the most open VAV box damper). This information shall dynamically update with changes in the location of the critical zone.
6. During commissioning and with the Engineer/Owner, the Controls Contractor shall confirm the performance of fan pressure optimization by conducting a field functional test that demonstrates critical zone reset.
7. Enable/disable optimization strategies (duct static optimization and ventilation optimization).
8. The following is a list of the air system points that shall be displayed on the operator touchscreen display:

    a. Rooftop Unit - Fan Status
    b. Rooftop Unit - Discharge Air Temperature
    c. Rooftop Unit - Discharge Air Temperature Setpoint Active
    d. VAV Air System - Duct Static Pressure (if used in system)
    e. VAV Air System - Duct Static Pressure Setpoint (if used in system)
    f. VAV Air System - Space Temperature Average (if used in system)
    g. VAV Box - Space Temperature Active
    h. VAV Box - Space Temperature Setpoint

L. Event Alarm Notification and Actions:

1. The WNAC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.

2. The WNAC shall be able to route any alarm condition to any defined user location whether connected to a LAN, remote via dial-up telephone connection, or WAN.
3. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including, but not limited to:

    a. Alarm
    b. Normal

4. Provide timed (scheduled) routing of alarms by class, object, group, or node.
5. Provide alarm generation from binary object "runtime" and/or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.

M. Treat control equipment and network failures as alarms and annunciated.

N. Annunciate alarms in any of the following manners as defined by the user:

1. Touchscreen message.
2. Email the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:

    a. Day of week.
    b. Time of day.
    c. Recipient.

3. Pagers via paging services that initiate a page on receipt of email message.
4. Graphic with flashing alarm object(s).

O. The FMCS shall record the following for each alarm:

1. Time and date.
2. Location (building, floor, zone, office number, etc.).
3. Equipment tag.
4. Acknowledge time, date, and user who issued acknowledgement.
5. Number of occurrences since last acknowledgement.

P. Give defined users proper access to acknowledge any alarm.

Q. A log of all alarms shall be maintained by the WNAC and/or a server (if configured in the system) and shall be available for review by the user.

R. WNAC Configuration:

1. Software Setup Utility:

    a. The WNAC shall be capable of being set up from the touchscreen interface.

2. Network Communication and System Setup:

    a. The WNACs shall be addressed by methods other than software settings, such as rotary switches, for ease in troubleshooting communication issues.

b. Communicating WNAC devices shall be automatically discovered by the coordinating system panel.
c. Equipment shall be combined to form systems from the local display.

2.7 BACNET FMCS

A. The intent of the FMCS is to integrate the mechanical equipment associated with this project into one system for global monitoring, control and alarming compliant with ANSI/ASHRAE Standard 135-2001 BACnet. System must be fully integrated and coordinated with mechanical equipment DDC controllers furnished and installed in the equipment manufacturer's factory.

B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices in the system. Adherence to industry standards including the latest ANSI/ASHRAE Standard 135 (BACnet) to assure interoperability between all system components is required. Physical connection of BACnet devices shall be via Ethernet (BACnet Ethernet/IP) and/or RS-485 (BACnet MSTP).

C. All mechanical equipment that is intended to be integrated into the FMCS shall be controlled by custom application or application specific controllers that meet the interface requirements as detailed in the communications section of this specification.

D. Interoperable BACnet Controller (IBC):

1. Controls shall be microprocessor based interoperable BACnet controllers (IBC) in accordance with the latest ANSI/ASHRAE Standard 135. Provide IBCs for unit ventilators, fan coils, heat pumps, terminal air boxes (TAB), and other applications. The application control program shall reside in the same enclosure as the input/output circuitry that translates the sensor signals.
2. The IBCs shall be listed by the BACnet testing laboratory (BTL) as follows:

    a. BACnet Building Controller(s) (B-BC).
    b. BACnet Advanced Application Controller(s) (B-ACC).
    c. BACnet Application Specific Controller(s) (B-ASC).

3. The IBCs shall communicate with the NAC via an Ethernet connection at a baud rate of not less than 10 Mbps.
4. The Contractor supplying the IBCs shall provide documentation for each device, with the following information at a minimum:

    a. BACnet Device; MAC address, name, type and instance number.
    b. BACnet Objects; name, type and instance number.

2.8 TERMINAL AIR BOX (TAB) CONTROLLERS

A. FMCS Volume Controller: Electronic, furnished and installed by TCC. Boxes shall have pressure independent control to maintain constant air volume regardless of duct pressure changes up to 6 inches w.c. Provide velocity and static sensor at box inlet for use by unit controller. Set boxes for maximum and minimum settings shown on the drawings. Refer to Section 23 36 00 for additional information.

B. The controller shall support various digital and analog inputs and outputs as needed for damper control, control valves, electric coils, airflow sensors, remote heating, occupancy sensors, etc. and shall be capable of independent occupancy scheduling.

C. Controller shall provide continuous zone temperature histories internal to device for up to 24 hours and perform its own limit and status monitoring and alarms to limit unnecessary communications.

D. Operator interface to any ASC point data or programs shall be through network resident programs or portable operator's terminal connected to the specific controller.

E. Store all system setpoints, proportional bands, control algorithms, and other programmable parameters such that a power failure of any duration does not necessitate reprogramming of the controller.

F. BACnet TAB controllers shall either be B-AAC devices or B-ASC devices as required to meet the performance and BTL listing.

2.9 DATA COLLECTION AND STORAGE (TRENDING REQUIREMENTS)

A. The NAC shall be able to collect data for any property of any object and store resident in a cloud-based server that shall have, at a minimum, the following configurable properties:

1. Designating the log as interval or deviation.
2. For interval logs, configure the object for time of day, day of week and the sample collection interval.
3. For deviation logs, configure the object for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
4. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full or rollover the data on a first-in, first-out basis.
5. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.

B. Store all log data in a cloud-based server that is accessible from a standard web browser with security credentials.

C. All log data shall be available to the user in ALL the following data formats:

1. HTML.
2. XML.
3. Plain text.
4. Comma or tab separated values.

D. The NAC shall archive its log data remotely to a cloud-based server or other NAC on the network. Provide the ability to configure the following archiving properties:

1. Archive on time of day.
2. Archive on user-defined number of data stores in the log (buffer size).
3. Archive when log has reached its user-defined capacity of data stores.
4. Provide ability to clear logs once archived.

2.10 OPERATOR INTERFACES

A. Touchscreen Display:

1. 10" color touchscreen display that allows the users to accomplish the following tasks:

    a. Control the setpoints for multiple pieces of equipment with a single touch. Setpoint adjustment by the occupant shall be bound by editable limits. Occupant override of the system/equipment operating mode shall be possible with a single touch on the touchscreen display.
    b. The touchscreen display shall provide user access to a system schedule. Users shall have the ability to schedule events more than one year in advance. Exception schedules and holidays shall be shown clearly on the calendar, visible to the occupant on the touchscreen display.
    c. The touchscreen display shall offer PIN control, which shall limit system control access to only those with proper login credentials.
    d. The touchscreen display shall display the alerts that require service of the connected equipment.

B. Web User Interface Application:

1. The system shall be capable of supporting an unlimited number of clients using a standard web browser such as Edge, Firefox, or Chrome. Systems requiring additional software to enable a standard web browser to reside on the client machine, or manufacturer-specific browsers, are not acceptable. Interface shall be plug-in free.
2. The web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the graphic user interface. Systems that require different views or that require different means of interacting with objects, such as schedules or logs, are not permitted.
3. The web browser interface shall provide:

    a. Context sensitive online help and training system to assist in the operation and configuration of the system.
    b. Graphics pages for all equipment and system applications. These pages shall allow a servicer to obtain information relevant to the operation of the equipment and/or application.
    c. The following interface capabilities:

        1) Animated equipment graphics for each piece of equipment.
        2) Alarm indication for all equipment and system applications.
        3) Historical data logs. Data logs shall be begin recording at system startup.
        4) Fault detection and diagnostics (FDD) data and alarms including:

            a) Sensors and the ability to display the values for outside air, supply air, and return air (for differential economizer operation when required).

b) Indicate the following conditions: (1) free cooling available; (2) economizer enabled; (3) compressor enabled; (4) heating enabled, if the system is capable of heating; (5) mixed-air low limit cycle active.
c) Faults reported via the FMCS that automatically provides notification to facility personnel for the following faults: (1) air temperature sensor failure/fault; (2) not economizing when it should; (3) economizing when it should not; (4) damper not modulating; (5) excess outdoor air.

5) Demand response controls certified by the manufacturer capable of responding to a demand response signal from a certified Open ADR 2.0b Virtual End Node by automatically implementing the functions requested by the virtual end node from equipment down to the zone level.

C. Mobile Application:

1. A mobile application that enables access to the control system shall be included. The mobile application shall support the latest versions of both iOS and Android. The mobile application shall allow the user to accomplish the following tasks:

a. Control the setpoints for multiple pieces of equipment with a single touch.
b. Setpoint adjustment by the occupant shall be bound by editable limits.
c. Occupant override of the system/equipment operating mode shall be possible with a single touch.
d. FDD fault detection and diagnostics data and alarms.

2.11 ZONE AND BYPASS CONTROL DAMPERS

A. Rectangular Control Dampers - Standard Construction:

1. Shall be licensed to bear the AMCA Certified Rating Seal.
2. Test leakage and pressure drop per AMCA 500.
3. Frame: Hat-shaped channel, minimum 12 gauge extruded aluminum, and minimum 4" deep. Caulk or weld seams to prevent leakage.
4. Blades: Minimum 12 gauge extruded aluminum airfoil design, minimum 6" wide, and overlapping blades and blade seals (overlapping blade seals only is unacceptable).
5. Shaft: Non-cylindrical, solid aluminum or zinc plated steel with opening in blade to match profile of shaft. Shaft shall be securely fastened to the blade and of sufficient length to mount direct-coupled actuator. Damper manufacturer shall provide drive pin extensions and outboard bearing support brackets as required.
6. Bearings: Acetal (Delrin/Celcon) inner bearing fixed to an aluminum shaft, rotating within a polycarbonate outer bearing inserted in the frame. Provide thrust bearings for vertical damper applications.
7. Blade Seals: Extruded silicone gaskets secured in an integral slot within the blade.
8. Side Seals: Stainless steel compression type or extruded silicone gasket secured in an integral slot within the frame.

9. Linkage: Shall be concealed in the frame, constructed of aluminum or corrosion-resistant zinc plated steel, and securely fastened to shaft. Blades linked for opposed operation, unless noted otherwise on the drawings. Blades shall close evenly. Use one direct-coupled actuator per damper section. Jack-shafting is not acceptable.
10. Size Limits: 48" maximum horizontal blade length, 24 square foot maximum area per damper. Total cross-sectional area of dampers in ducts shall be at least as large as the duct without the use of blank-off sections.
11. Maximum Leakage: Class 1A at 1" w.c. pressure differential for a 24" x 24" damper.
12. Maximum Pressure Drop for Opposed Blade Damper: 0.15" for 8,000 cfm through a 24"x24" damper (2000 fpm).
13. Maximum Pressure Drop for Parallel Blade Damper: 0.08" for 8,000 cfm through a 24"x24" damper (2000 fpm).

B. Round Galvanized Steel Control Dampers:

1. Test leakage and pressure drop per AMCA 500.
2. Frame: Minimum 20 gauge galvanized steel, 10" long.
3. Bearings: Provide thrust bearings for vertical damper applications.
4. Blades: Two-layer galvanized steel, equivalent 14 gauge thickness with neoprene or polyethylene foam seal enclosed in two-piece blade construction up to 24", 10 gauge steel over 24".
5. Linkage: Stainless steel, minimum 1/2" diameter shaft through 24", 3/4" shaft over 24" size. Stainless steel bearings. Shaft shall be securely keyed to blades and of sufficient length to mount direct-coupled actuator. Install damper with the shaft horizontal to the floor. Damper manufacturer shall provide drive pin extensions and outboard bearing support brackets as required.
6. Maximum Leakage: 8 cfm maximum at 1" w.c. pressure differential for a 24" x 24" damper.
7. Maximum Pressure Drop: 0.10" for 6,280 cfm through a 24" damper (2,000 fpm).

2.12 DAMPER ACTUATORS

A. Damper Actuators - Electronic:

1. Actuator shall be UL 873 or 60730 listed and provided with NEMA housing for applicable environment, electronic overload protection to prevent actuator damage due to over-rotation. Mount actuator by means of a V-bolt dual nut clamp with a V-shaped toothed cradle, directly couple and mount to the valve bonnet stem, or ISO-style direct-coupled mounting pad. Actuators shall be capable of being mechanically and electrically paralleled to increase torque, if required.
2. Actuators shall be warranted for a period of five (5) years from the date of production, with the first two (2) years unconditional.
3. Proportional actuator position shall be proportional to analog or pulse width modulating signal from electronic control system.
4. Fail-Safe Dampers: Where shown on the drawings or sequences, fail-safe mechanism shall operate the damper to the fail position following power interruption.

a. Mechanical/Spring: Mechanical spring return mechanism to drive controlled drive to an end position (open or close) on loss of power.
b. Electronic: Electronic fail-safe shall incorporate an active balancing circuit to maintain equal charging rates among the capacitors. The power fail position shall be proportionally adjustable between 0 to 100% in 10 percent increments with a 2 second operational delay.

5. Feedback: Where shown on drawings or sequences, provide analog feedback signal for positive position indication.
6. Damper End Switches: Where shown on the drawings or sequences, provide end switches to prove damper reaches open/closed position.

2.13 VALVE ACTUATORS

A. General:

1. Actuators shall be sized to operate the valve through its full range of motion and shall close against pump shutoff pressure without producing audible noise at any valve position.
2. Provide visual position indication.
3. Mount actuator directly on valve or provide linear motion assembly as required for valve type.

B. Valve Actuators - Electronic:

1. Actuator shall be UL 873 or 60730 listed and provided with NEMA housing for applicable environment, electronic overload protection to prevent actuator damage due to over-rotation. Mount actuator by means of a V-bolt dual nut clamp with a V-shaped toothed cradle, directly couple and mount to the valve bonnet stem, or ISO-style direct-coupled mounting pad. Actuators shall be capable of being mechanically and electrically paralleled to increase torque, if required.
2. Actuators shall be warranted for a period of five (5) years from the date of production, with the first two (2) years unconditional.
3. Proportional actuator position shall be proportional to analog or pulse width modulating signal from electronic control system.
4. Fail-Safe Valves: Where shown on the drawings or sequences, fail-safe mechanism shall operate the valve to the fail position following power interruption.

a. Mechanical/Spring: Mechanical spring return mechanism to drive controlled drive to an end position (open or close) on loss of power.
b. Electronic: Electronic fail-safe shall incorporate an active balancing circuit to maintain equal charging rates among the capacitors. The power fail position shall be proportionally adjustable between 0 to 100% in 10 percent increments with a 2 second operational delay.

5. Feedback: Where shown on drawings or sequences, provide analog feedback signal for positive position indication.

2.14 ZONE SENSORS

A. Temperature Sensors:

1. Room Temperature Sensor:

a. Sensor Only: Two-piece construction, ventilated plastic enclosure, off-white color, thermistor sensing element or resistance temperature device (RTD), 45°F to 90°F operating range, ± 0.50°F accuracy, no setpoint adjustment or override button.
b. Sensor with Setpoint Adjustment: Two-piece construction, ventilated plastic enclosure, off-white color, thermistor sensing element or resistance temperature device (RTD), 45°F to 90°F operating range, ± 0.50°F accuracy, with exposed single setpoint adjustment (no numeric temperature scale - provide with a single warmer/cooler or red/blue visual scale), no override button.
c. Sensor with Override: Two-piece construction, ventilated plastic enclosure, off-white color, thermistor sensing element or resistance temperature device (RTD), 45°F to 90°F operating range, ± 0.50°F accuracy, occupied/unoccupied override button with LED, no setpoint adjustment.
d. Sensor with Setpoint Adjustment and Override: Two-piece construction, ventilated plastic enclosure, off-white color, thermistor sensing element or resistance temperature device (RTD), 45°F to 90°F operating range, ± 0.50°F accuracy, with exposed single setpoint adjustment (no numeric temperature scale - provide with a warmer/cooler or red/blue visual scale), occupied/unoccupied override button with LED.
e. Sensors shall include the following functions:

1) A signal strength on the space sensor display.
2) Error codes shall be displayed on the digital display. Error codes shall include: not associated, address to 000, improper software configuration, input voltage too high, or general sensor failure. Codes shall be indicated on inside of sensor back cover.
3) Text display shall be a minimum font size of 12 points.
4) Provide an LCD display readable in low light conditions, and text display shall be a minimum font size of 12 points.
5) Space/wall sensors shall be supplied with batteries having a minimum life of 15 years.
6) Space/wall sensors shall be supplied with power harvesting capabilities to supplement battery life.

2. Duct Temperature Sensor:

a. Thermistor or RTD type. Pneumatic transmitters with transducers are not acceptable.

B. Humidity Measuring Devices:

1. Humidity Sensors:

a. Humidity Sensors: Fully electronic with no moving parts or parts requiring periodic service. Accuracy shall be ± 5% of reading.
b. Humidity Sensors: Fully electronic with no moving parts or parts requiring periodic service. Accuracy shall be ± 2% of reading.

2. Humidistats:

a. Room Humidistats: Wall-mounted, proportioning type, with adjustable 2% RH throttling range, operating range from 30% to 80% at temperatures up to 110°F, cover with concealed setpoint.
b. Duct Humidistats: Proportioning insertion type, with adjustable 2% RH throttling range and operating range from 20% to 80% at temperatures up to 150°F.
c. High Limit Duct Humidistat: 2-position insertion type, with differential maximum 2% RH.

C. Enthalpy Sensors: Duct-mounted enthalpy sensor shall include solid state temperature and humidity sensors with electronics that shall output a 4-20 ma signal input to the controller upon a varying enthalpy (total heat) to enable economizer modes of operation when outside air enthalpy is suitable for free cooling.

D. Pressure Measuring Devices:

1. Pressure Transmitters/Transducer:

a. Air-to-Air:

1) Provide transducer having the following minimum performance for measuring duct static pressure for VFD control or measuring differential pressure across filter banks:

a) Accuracy: ±1.0% FS
b) Non-Linearity, BFSL: ±0.96% FS
c) Hysteresis: 0.10% full scale
d) Non-Repeatability: 0.05% full scale
e) Thermal Effects (compensated range): 0°F to +150°F
f) Maximum Line Pressure: 10 PSI
g) Zero/Span Shift: 0.033%FS/°F
h) Long Term Stability: 0.5%FS/1 year

2) Provide transducer with the following minimum performance for measuring differential pressure across piezometer fan inlet airflow measuring stations:

a) Unit shall come factory equipped with static tube attached.
b) Unit shall include: (1) LCD shall display differential pressure on face of sensor enclosure over the entire operational range; (2) IPCC-rated polycarbonate enclosure with short circuit-proof outputs and reverse polarity protected inputs.
c) Accuracy at 72°F: ±0.25% FS
d) Stability: ±0.25% full scale per year

e) Temperature Error: (1) Zero: ±0.025% full scale per °C.; (2) Span: Maximum ±0.03% full scale per °C
f) Environmental Operating Range: 32°F to 140°F.
g) Overpressure: (1) Proof: 2 psi; (2) Burst: 3 psi
h) Humidity: 0% to 95% RH non-condensing.

2. BTU Meter:

a. General:

1) Microprocessor based thermal energy meter with LCD display.
2) BTU meter shall work with all common types of flow meters, temperature sensors, and pressure sensors. It shall display total energy, total flow, energy rate, flow rate, supply temperature, and return temperature.
3) It shall be compatible with BACnet network interface and shall input these values to the network area controller.
4) It shall be suitable for liquid temperature range of 25°F to 240°F and ambient temperature range: -20°F to 140°F.
5) BTU meter shall have LCD display as follows:

a) Alpha: 16 character, 0.2" high
b) Numeric: 6 digit, 0.4" high
c) Rate Display Range: 0-9,999,999
d) Total display Range: 0-9,999,999

6) The meter shall be compatible with liquid flow signal input of 0-15 V pulse output or 4-20 mA analog output from any flow meter.
7) The meter shall provide output signals as follows:

a) Isolated solid-state dry contacts for energy total, maximum contact rating: 100 mA, 50 V.
b) Multiple isolated analog or digital outputs for energy rate, flow rate, supply and return temperature and delta temperature. Output type: 4-20mA, 0-10 V, or 0-5 V.
c) Interval Data Logging: This option provides at least 24 hours of rate and total data logging in 15-minute intervals. Data includes date/time stamp, measured value, and scaling factors when appropriate.
d) Network Interface: BACnet.

8) Electrical Input Power: 120 VAC, 60 Hz.

b. Accuracy:

1) The accuracy of BTU meter shall be ± 0.5% of flow rate reading over a range, with a repeatability of 0.1%.

c. Warranty:

1) Each BTU meter assembly shall carry a performance warranty of at least two years from the date of installation and startup. This warranty shall cover parts and labor for repair or replacement of the meter assembly. Performance during the warranty period shall satisfy the above-stated requirements for accuracy and repeatability.

d. Approved Manufacturers:

1) Onicon
2) Yokogawa
3) Badger

3. Duct-Mounted Airflow Measuring Stations:

a. Duct-Mounted Airflow Measuring Stations (AFMS) - Thermal Dispersion:

1) Provide airflow/temperature measurement devices where indicated on the plans.
2) Each AFMS shall consist of one or more sensor probes and a single, remotely mounted, microprocessor-based transmitter capable of independently processing up to 16 independently wired sensor assemblies.

a) Each sensor assembly shall contain two individually wired, hermetically sealed bead-in-glass thermistors.
b) Thermistors shall be mounted in the sensor assembly using a marine-grade, waterproof epoxy. Thermistor leads shall be protected and not exposed to the environment.
c) Devices using chip-in-glass or diode-case chip thermistors are not acceptable.
d) Devices using less than two thermistors in each sensor assembly are not acceptable.
e) Devices using platinum wire RTDs are not acceptable.
f) Devices having electronic circuitry mounted in or at the sensor probe are not acceptable.
g) Pitot tubes and arrays are not acceptable.
h) Vortex shedding devices are not acceptable.

3) All Sensor Probes:

a) Each sensor assembly shall independently determine the velocity and temperature at its measurement point.
b) Each sensor assembly shall be calibrated at a minimum of 16 airflow rates and 3 temperatures to standards that are traceable to the National Institute of Standards and Technology (NIST).
c) Airflow measuring station assembly accuracy shall be ± 2% of reading over the entire operating airflow range. Temperature accuracy shall be ± 0.15°F between -20°F and 160°F.

d) The operating humidity range for each sensor probe shall be 0-99% RH (non-condensing).
e) Each sensor probe shall have an integral, UL listed, plenum rated cable and terminal plug for connection to the remotely mounted transmitter. A single manufacturer shall provide both the airflow/temperature measuring probe(s) and transmitter for each measurement location.
f) The number of probes shall be as recommended by the manufacturer to achieve the specified accuracy.

4) Duct and Plenum Probes:

a) Probes shall be constructed of extruded, gold anodized, 6063 aluminum tube. All wires within the aluminum tube shall be Kynar coated.
b) Probe assembly mounting brackets shall be constructed of 304 stainless steel.
c) The operating airflow range shall be 0 to 5,000 FPM unless otherwise indicated on the plans.

5) Sensor Density:

Area (sq.ft.)	Total # of Sensors Required
Less than 2	4
2 to less than 4	6
4 to less than 8	8
8 to less than 16	12
≥ 16	16

6) Transmitters:

a) The transmitter shall have an integral 16-character alphanumeric LCD display capable of simultaneously displaying individual airflow and temperature.
b) The transmitter shall be capable of field configuration and diagnostics using an on-board interface and LCD display.
c) The operating temperature range for the transmitter shall be -20°F to 120°F.

d) The transmitter shall be capable of communicating with other devices using one of the following interface options: (1) Linear analog output signals for airflow and temperature: Field selectable, fuse protected and isolated, 0-10VDC/4-20mA (4-wire); (2) RS-485: Field selectable BACnet-ARCNET, BACnet-MS/TP. BACnet devices shall provide analog variables for airflow and temperature containing individual sensor airflow rate and temperature data.; (3) 10 Base-T Ethernet: Field selectable BACnet Ethernet, BACnet-IP. Provide dynamic link libraries and VBA functions to interface Ethernet devices to Microsoft Excel for remote monitoring of airflow and temperature using current operating system.

E. Occupancy Sensors:

1. Use auxiliary contacts on sensor provided and installed by the Electrical Contractor. Refer to electrical drawings for sensor location and specifications. Coordinate with Electrical Contractor.
2. Ceiling mounted, dual technology: sonic and passive infrared, 360° coverage pattern, zero crossing circuitry, adjustable sensitivity and time delay (initial setting: Time delay - 5 minutes unless noted otherwise below, integral isolated relay with normally open and normally closed outputs, LED indicator, five-year warranty, UL listed. TCC shall submit manufacturer supplied sensor layout drawing for shop drawing review. Provide full room coverage as recommended by manufacturer.

SPACE OCCUPANCY INITIAL SETTING SCHEDULE

SPACE	INITIAL TIME DELAY SETTING
Classroom	10 minutes
Reception	20 minutes
Healthcare Procedure Room (Operating Room)	30 minutes

F. Carbon Dioxide Sensors:

1. Microprocessor based non-dispersive infrared sensor with range of 0 to 2,000 ppm CO2 with ± 100 ppm accuracy, maximum drift (compensated) of ± 5% full scale in five years, VOC software and hardware sensing, duct mounting where applicable, 0-10V dc or 4-20 mA output directly proportional to ppm, adjustable alarm limit, membrane filter, and terminal block. The diffusion gas chamber in the sensor shall incorporate a reflective light pipe or wave guide surrounded by a gas permeable membrane that prevents particulate contamination of the sensor. Unit shall have selectable IAQ mode with output signal and sum of CO2 and VOC levels.

G. Miscellaneous Devices:

1. Application Specific Controller Power Supply:

a. For use with terminal air box.
b. Provide multiple enclosures with the following accessories and components as required to provide 24VAC power to terminal air boxes, differential pressure monitors, damper actuators, valve actuators, and other components and devices as required.
c. NEMA-1 steel enclosures (12"x12"x6") with separate high and low voltage compartments and separate access covers.
d. Either one 300 VA power supply with three 100 VA Class 2 outputs, or one 500 VA power supply with five 100 VA Class 2 outputs.
e. Primary side shall receive 480/277/240/120 input to 24 VAC ungrounded, isolated output on the secondary side.
f. Each secondary output shall include a 4 amp breaker, on/off switch, and LED indicator. Terminal blocks shall accept 16-22 AWG wire.
g. Acceptable Manufacturer:

1) RIB Functional Devices Model MSH300A-LVC or PSH500A-LVC

2. Thermostat and Sensor Enclosures:

a. Clear plastic guard with lock. Wire guard with tamperproof screws. Setpoint shall be adjustable with cover in place. Fasten to wall separately from thermostat. Provide guards in all corridors, gymnasiums, locker rooms, toilet rooms, assembly halls and as noted on the drawings.
b. Heavy Duty Enclosure:

1) Perforated steel, tamperproof locking thermostat and control device enclosure.
2) Box shall be nominally 8"x6"x2" deep or sized as required to fit devices to be enclosed.
3) Perforated cover shall be 16 gauge steel with maximum 3/16" perforations on maximum 1/4" staggered centers for a 55% free area.
4) Secure to wall from inside of box. Cover shall be secured by tamperproof screws to frame.
5) Color shall match electrical devices. Verify color with the Electrical Contractor.

2.15 CONDUIT AND BOXES

A. Conduit and Boxes: Refer to Electrical Section 26 05 33 for materials, sizing, and other requirements.

B. Conduit and Box Identification (Color and Labeling):

1. Refer to the Temperature Control Contractor notes located on the mechanical cover sheet for raceway and box color requirements.
2. Refer to Electrical Section 26 05 53 for raceway and box labeling requirements.

2.16 WIRE AND CABLE

A. Wire and Cable: Refer to Electrical Section 26 05 13 for wire and cable materials.

1. Wire and Cable Color: Refer to the Temperature Control Contractor notes located on the mechanical cover sheet for wire and cable color requirements.

2.17 SEQUENCE OF OPERATION (PRESCRIPTIVE)

A. The following items are prescriptive sequences. Refer to the drawings for the complete sequence of operations.

B. System Operating Modes: The system controller shall send the equipment controllers Occupied/Unoccupied, Morning Warm-up/Pre-cool, and Heat/Cool modes. If communication is lost, the equipment controllers shall operate using default modes and setpoints.

1. Night Setback: During unoccupied mode, the system shall shut off. If the zone temperature drifts to the unoccupied heating or cooling setpoint, the system shall start up to heat or cool the zone while the OA damper remains closed (unless economizing).
2. Optimal Start: The system controller shall automatically determine the optimal start time such that each zone reaches its occupied setpoint just in time for scheduled occupancy.
3. Demand Controlled Ventilation: For those zones equipped with an occupancy sensor or CO_2 sensor, outdoor airflow shall be reset based on occupancy status and/or measured CO_2 concentration.

C. Single-Zone VAV System:

1. Occupied Heat/Cool: The RTU shall modulate the supply fan, modulate (or cycle) compressors, modulate (or stage) heat, and/or enable airside economizing to maintain zone temperature at setpoint. The OA damper shall modulate in proportion to changing supply fan speed to bring in the required amount of ventilation.
2. Morning Warm-Up/Pre-Cool: The RTU shall operate the supply fan and modulate (or cycle) compressors or modulate (or stage) heat to raise/lower zone temperature to its occupied setpoint. The OA damper shall remain closed, unless economizing.

D. Multiple-Zone VAV System with Terminal Heat:

1. Occupied Heat/Cool: Each VAV terminal shall use pressure-independent control, with airflow measurement, to vary primary airflow and/or modulate (or stage) heat to maintain zone temperature at its occupied setpoint. The RTU shall modulate the supply fan to maintain duct static pressure at setpoint and modulate (or cycle) compressors, modulate (or stage) heat, and/or enable airside economizing to maintain discharge air temperature at setpoint. The OA damper shall modulate in proportion to changing supply fan speed to bring in the required amount of ventilation.

2. Morning Warm-Up/Pre-Cool: Each VAV terminal unit shall vary primary airflow and/or modulate (or stage) heat to raise/lower zone temperature to its occupied setpoint. The RTU shall modulate the supply fan to maintain duct static pressure at setpoint and modulate (or cycle) compressors or modulate (or stage) heat to maintain discharge air temperature at setpoint. The OA damper shall remain closed, unless economizing.
3. Fan Pressure Optimization: The system controller shall monitor all VAV damper positions and reset the RTU's duct static pressure setpoint based on the position of the furthest-open damper.
4. Discharge Air Temperature Reset: The system controller shall reset the RTU's discharge air temperature setpoint based on the current outdoor air temperature or zone cooling/heating demand.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Verify that systems are ready to receive work. Beginning of installation means installer accepts existing conditions.

B. Install system and materials in accordance with manufacturer's instructions.

C. Drawings of the TCS and FMCS network are diagrammatic only. Any apparatus not shown but required to meet the intent of the project documents shall be furnished and installed without additional cost.

D. Install all operators, sensors, and control devices where accessible for service, adjustment, calibration, and repair. Do not install devices where blocked by piping or ductwork. Devices with manual reset or limit adjustments shall be installed below 6'-0" if practical to allow inspection without using a ladder.

E. Verify locations of wall-mounted devices (such as thermostats, temperature and humidity sensors, and other exposed sensors) with drawings and room details before installation. Coordinate mounting heights to be consistent with other wall-mounted devices. Maximum height above finished floor shall not exceed 48". In accordance with the requirements of LEED EQc1: Outdoor Air Delivery Monitoring, install all wall-mounted CO2 sensors between 3 feet and 6 feet above the floor.

F. Mount control panels adjacent to associated equipment on vibration-free walls or freestanding angle iron supports. One cabinet may accommodate more than one system in same equipment room.

G. After completion of installation, test and adjust control equipment.

H. Check calibration of instruments. Recalibrate or replace.

I. Furnish and install conduit, wire, and cable per the National Electric Code, unless noted otherwise in this section. All hardware, software, equipment, accessories, wiring (power and sensor), relays, sensors, power supplies, transformers, and instrumentation required for a complete and operational FMCS system, but not shown on the electrical drawings, are the responsibility of the TCC.

J. Remodeling:

1. All room devices as indicated on the drawings shall be removed by this Contractor. The Contractor shall also prepare the wall for finishes. Preparing the wall shall include patching old anchor holes (after the anchoring device has been removed) and sanding the wall to remove old paint outlines remaining from original devices. The wall shall be painted to match the existing wall prior to the installation of the new room device. If wall covering requires patching, the Contractor shall furnish new wall covering to match existing. If new wall covering is not available to match existing, the Contractor shall furnish a white acrylic or Plexiglas plate, 1/4" thick and sized to cover the void.

K. Labels For Control Devices:

1. Provide labels indicating service of all control devices in panels and other locations.
2. Labels may be made with permanent marking pen in the control panels if clearly legible.

3.2 CONDUIT AND BOXES INSTALLATION

A. Conduit and Box Installation: Refer to Electrical Section 26 05 33 for execution and installation.

B. Conduit and Box Identification (color and labeling) installation. Refer to Electrical Section 26 05 53 for raceway and box identification installation.

C. Outlet Box Schedule: Thermostat/temperature sensor:

1. Dry Interior Locations: Provide 4" square galvanized steel with raised cover to fit flush with finished wall line. When located in concrete block walls, provide square edge title cover of sufficient depth to extend out to face of block or masonry boxes.
2. Other Conditions: Refer to Electrical Section 26 05 33 for requirements.

3.3 WIRE AND CABLE INSTALLATION

A. Wire and Cable Installation: Refer to Electrical Section 26 05 13 for execution and installation.

B. Field Quality Control:

1. Inspect wire and cable for physical damage and proper connection.
2. Torque test conductor connections and terminations to manufacturer's recommended values.

3. Perform continuity test on all conductors.
4. Protection of cable from foreign materials:

    a. It is the Contractor's responsibility to provide adequate physical protection to prevent foreign material application or contact with any cable type. Foreign material is defined as any material that would negatively impact the validity of the manufacturer's performance warranty. This includes, but is not limited, to overspray of paint (accidental or otherwise), drywall compound, or any other surface chemical, liquid or compound that could come in contact with the cable, cable jacket or cable termination components.
    b. Overspray of paint on any cable, cable jacket or cable termination component will not be accepted. It shall be the Contractor's responsibility to replace any component containing overspray, in its entirety, at no additional cost to the project. Cleaning of the cables with harsh chemicals is not allowed. This requirement is regardless of the PASS/FAIL test results of the cable containing overspray. Should the manufacturer and warrantor of the structured cabling system desire to physically inspect the installed condition and certify the validity of the structured cabling system (via a signed and dated statement by an authorized representative of the structured cabling manufacturer), the Owner may, at their sole discretion, agree to accept said warranty in lieu of having the affected cables replaced. In the case of plenum cabling, in addition to the statement from the manufacturer, the Contractor shall also present to the Owner a letter from the local Authority Having Jurisdiction stating that they consider the plenum rating of the cable to be intact and acceptable.

C. Installation Schedule:

1. Conduit terminations to all devices installed in applications with rotating equipment, expansion/contraction or vibration shall be made with flexible metallic conduit, unless noted otherwise. Final terminations to exterior devices installed in damp or wet locations shall be made with liquidtight flexible metallic conduit. Terminations in hazardous areas, as defined in the National Electrical Code, shall be made with flexible conduit rated for the environment.

3.4 FMCS INSTALLATION

A. Coordinate voltage and ampacity of all contacts, relays, and terminal connections of equipment being monitored or controlled. Voltage and ampacity shall be compatible with equipment voltage and be rated for full ampacity of wiring or overcurrent protection of circuit controlled.

B. Naming Conventions: Coordinate all point naming conventions with Owner standards. In the absence of Owner standards, naming conventions shall use equipment designations shown on plans.

3.5 COMMISSIONING

A. Upon completion of the installation, this Contractor shall load all system software and start up the system. This Contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to ensure that the system is functioning in full accordance with these specifications.

B. This Contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the FMCS system operation. Test shall include onsite testing to verify each wireless device is responding to signals from other wireless devices and the cloud-based server without interruption.

C. This Contractor shall prove that the controls network is functioning correctly and within acceptable bandwidth criteria and shall test the system with an approved protocol analysis tool. Provide a log and statistics summary showing that each channel is within acceptable parameters. Each channel shall be shown to have at least 25% spare capacity for future expansion.

D. Upon completion of the performance tests described above, repeat these tests, point by point, as described in the validation log above in the presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.

E. System Acceptance: Satisfactory completion is when this Contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.6 PREPARATION FOR BALANCING

A. Verify that all dampers are in the position indicated by the controller (e.g., open, closed or modulating).

B. Check the calibration and setpoints of all controllers.

C. Check the locations of all thermostats for potential erratic operation from outside influences such as sunlight, drafts, or cold walls.

D. Check that all sequences operate as specified. Verify that no simultaneous heating and cooling occurs, unless specified. Observe that heating cannot begin at TAB reheat terminals until the unit is at the minimum cfm.

E. Verify the operation of all interlock systems.

3.7 TEST AND BALANCE COORDINATION

A. The Contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.

B. The tools used during the test and balance process shall be returned at the completion of the testing and balancing.

3.8 DEMONSTRATION AND ACCEPTANCE

A. At completion of installation, provide four hours minimum instruction for operators. Demonstrate operation of all controls and systems. Describe the normal operation of all equipment.

3.9 TRAINING

A. On-Site:

1. After completion of commissioning, the manufacturer shall provide 4 consecutive hours of training for 2 Owner's representatives. The training course shall enable the Owner's representatives to perform Day-to-Day Operations as defined herein. A factory-trained instructor with experience in presenting the training material and the system programmer for this project shall perform the training.

B. Day-to-Day Operations - Training Description:

1. Proficiently operate the system.
2. Understand control system architecture and configuration.
3. Understand FMCS systems components.
4. Operate the web user interface, touchscreen display, and mobile application.
5. Log-on and off the system.
6. Access reports and logs.
7. Adjust and change system setpoints, time schedules, and holiday schedules.
8. Recognize malfunctions of the system by observation of the graphic visual signals.
9. Understand system drawings and Operation and Maintenance manual.
10. Understand the job layout and location of control components.
11. Access data from FMCS controllers and ASCs.

C. System Management - Training Description:

1. Interface with job-specific, third-party operator software.
2. Add new users and understand password security procedures.

3.10 INSTALLATION OF SENSORS

A. Install sensors in accordance with the manufacturer's recommendations.

B. Mount sensors rigidly and adequately for the environment within which the sensor operates.

C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.

D. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.

E. Averaging sensors and low limits shall be installed at the top of the assembly with the element on a slight downward incline away from the sensor making a serpentine pattern over the cross-sectional area with elements spaced not over 12" apart and within 6" of the top and bottom of the area.

F. All pipe-mounted temperature sensors shall be installed in immersion wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.

G. Install outdoor air temperature sensors on exterior of north wall, complete with sun shield at designated location approved by Architect/Engineer. TCC shall prime and paint the device enclosure. Color selection by Architect.

H. Install all wall-mounted CO_2 sensors between 3 feet and 6 feet above the floor.

END OF SECTION 23 09 05

SECTION 23 09 13 - INSTRUMENTATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Thermometers.

B. Test Plugs.

C. Static and Differential Airflow Pressure Gauges.

1.2 SUBMITTALS

A. Submit shop drawings per Section 23 05 00. Include list that indicates use, operating range, total range and location for manufactured components.

PART 2 - PRODUCTS

2.1 THERMOMETERS

A. Dial Type:

1. 4-1/2" diameter, hermetically sealed case. Stainless steel case and stem. Accuracy of 1% full scale with external recalibrator.
2. Select thermometers for appropriate temperature range. Adjustable elbow joint with locking device to allow rotation of thermometer to any angle.
3. Stem lengths as required for application with minimum insertion of 2-1/2".
4. Thermometers for water, steam, or oil shall have brass or steel separable socket. Thermometer wells shall be stainless steel, pressure rated to match piping system design pressure; with 2 inch extension for insulated piping and threaded cap nut with chain permanently fastened to well and cap. Thermometers for air shall have an aluminum or brass duct flange.
5. Manufacturer:

    a. Ashcroft
    b. Marsh
    c. Marshalltown
    d. Miljoco
    e. Tel-Tru
    f. Trerice
    g. U.S. Gauge
    h. Weiss
    i. Weksler, Wika.

B. Select scales to cover expected range of temperatures.

2.2 TEST PLUGS

A. Test Plug: 1/4" or 1/2" brass fitting and cap, with Nordel core for temperatures up to 275°F, for receiving 1/8" outside diameter pressure or temperature probe. Plugs shall be rated for zero leakage from vacuum to 500 psi.

B. Provide extended units for all plugs installed in insulated piping.

C. Test Kit: Carrying case, internally padded and fitted containing one 3-1/2" diameter pressure gauge with 0-100 psi range, one gauge adapter with 1/8" probes, two 1-1/2" dial thermometers with 0° to 220°F and -25°F to 125°F ranges and 5" stems.

1. Manufacturers:

a. Sisco
b. Flow Design
c. Peterson Equipment
d. MG Piping Products Co.
e. Miljoco, Trerice
f. Watts Regulator.

2.3 STATIC AND DIFFERENTIAL AIRFLOW PRESSURE GAUGES

A. Diaphragm-activated gauge with 4-3/4" dial, cast aluminum case, sealed interior, designed to resist shock and vibration, and rated for 15 psig.

B. Accuracy shall be ± 3% of full scale maximum throughout entire range at 70°F.

C. Provide mounting brackets, probes, and shutoff valves required for proper installation.

D. The range and service shall be as required for application or as noted on the drawings.

E. Manufacturers:

1. Dwyer Magnehelic Series 2000
2. Marshalltown Instrument Series 85C.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Installation Requirements:

1. Install per manufacturer's instructions.
2. Coil and conceal excess capillary on remote element instruments.
3. Install gauges and thermometers in locations where they are easily read from normal operating level.
4. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

B. Thermometers:

1. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2" for installation of thermometer sockets.
2. Install thermometer sockets adjacent to control system thermostat, transmitter and sensor sockets.
3. Locate duct thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.

END OF SECTION 23 09 13

SECTION 23 31 00 - DUCTWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Galvanized Ductwork

B. Ductwork Reinforcement

C. Ductwork Sealants

D. Rectangular Ductwork

E. Flexible Duct

F. Leakage Testing

G. Ductwork Penetrations

H. Duct Cleaning

I. Painting

1.2 SUBMITTALS

A. Submit shop drawings per Section 23 05 00.

B. Submit duct fabrication standards in compliance with SMACNA and these specifications. Clearly indicate metal gauges, reinforcement, and joining methods intended for use for each pressure classification. Furnish details of all common duct fittings and joint connections to be used on this project.

C. The Architect/Engineer may require field verification of sheet metal gauges and reinforcing to verify compliance with these specifications. At the request of the Architect/Engineer, the contractor shall remove a sample of the duct for verification. The contractor shall repair as needed.

D. Duct Layout Drawings: Submit detailed duct layout drawings at 1/4" minimum scale complete with the following information:

1. Actual duct routing, ductwork fittings, actual sheet metal dimensions including insulation liner and wrap, duct hanger and support types, ductwork accessories, etc. with lengths and weights noted.
2. Differentiate ducts that are wrapped. Include insulation thickness, type of insulation, and acoustical lagging.
3. Room names and numbers, ceiling types, and ceiling heights.
4. Indicate location of all beams, bar joists, etc. along with bottom of steel elevations for each member.

5. Verify clearances and interferences with other trades prior to preparing drawings. IMEG will provide electronic copies of ventilation drawings for contractor's use if the contractor signs and returns the "Electronic File Transfer" waiver. IMEG will not consider blatant reproductions of original file copies an acceptable alternative for this submittal. Refer also to Section 23 05 00.

E. Duct Leakage Test Summary Report: Upon completion of the pressure test described in Part 3, the Contractor shall submit an air duct leakage test summary report as outlined in the SMACNA HVAC Duct Leakage Test Manual.

1.3 DEFINITIONS

A. Duct Sizes shown on drawings are inside clear dimensions. Maintain clear dimensions inside any lining.

B. Transitions are generally not shown in single-line ductwork. Where sizes change at a divided flow fitting, the larger size shall continue through the fitting.

C. Exterior Duct: Ductwork located outside the conditioned envelope including exposed ductwork above the roof, outside exterior walls, in attics above insulated ceilings, inside parking garages, and crawl spaces.

D. Interior Duct: Ductwork located within the conditioned envelope including return air plenums and indirectly conditioned spaces.

1.4 COORDINATION DRAWINGS

A. Reference Coordination Drawings article in Section 23 05 00 for required duct systems electronic CAD drawings to be provided to Coordinating Contractor for inclusion into composite coordination drawings.

B. Duct drawings shall be at 1/4" minimum scale complete with the following information:

1. Actual duct routing, ductwork fittings, actual sheet metal dimensions including insulation liner and wrap, duct hanger and support types, ductwork accessories, etc. with lengths and weights noted.
2. Differentiate ducts that are lined or wrapped. Include insulation thickness, type of insulation, and acoustical lagging.
3. Location and size of all duct access doors.
4. Room names and numbers, ceiling types, and ceiling heights.
5. Indicate location of all beams, bar joists, etc. along with bottom of steel elevations for each member.
6. IMEG will provide electronic file copies of ventilation drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by IMEG. IMEG will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings. Architectural plans will need to be obtained from the Architect.

PART 2 - PRODUCTS

2.1 SHAPE

A. Rectangular Duct - Single Wall:

1. General Requirements:

a. All ductwork gauges and reinforcements shall be as listed in SMACNA Duct Construction Standards Chapter 2. Where necessary to fit in confined spaces, furnish heaviest duct gauge and least space consuming reinforcement.
b. Transitions shall not exceed the angles in Figure 4-7.

2. Exceptions and modifications to the 2005 HVAC Duct Construction Standards are:

a. All ducts shall be cross-broken or beaded.
b. Snap lock seams are not permitted.
c. Turning vanes shall be used in all 90° mitered elbows, unless clearly noted otherwise on the drawings. Vanes shall be as follows:

1) Type 1:

a) Description: Single wall type with 22-gauge (0.029") or heavier vanes, 3-1/4" blade spacing, and 4" to 4-1/2" radius. Vanes hemmed if recommended by runner manufacturer. Runners shall have extra-long locking tabs. C-value independently tested at below 0.26. EZ Rail II by Sheet Metal Connectors or equal.
b) Usage: Limited to 3,000 fpm and vane lengths 36" and under.

2) Type 2:

a) Description: Double wall type with 3-1/4" blade spacing, 4-1/2" radius, 24-gauge minimum, and SMACNA Type 1 runners. C-value below 0.27.
b) Usage: No limits other than imposed by the manufacturer. Provide intermediate support for vanes over 48" long.

3) Type 3 (acoustical - where acoustical lagging is located or as noted on drawings):

a) Description: Same as Type 2, except filled with fiberglass and with slotted or perforated inner curve. Minimum insertion loss of 9 dB at 250 Hz and 6 dB at 1 KHz.
b) Usage: No limits other than imposed by the manufacturer. Provide intermediate support for vanes over 48" long.

4) Turning vanes shall operate quietly. Repair or replace vanes that rattle or flutter.

5) Runners must be installed at a 45° angle. Elbows with different size inlet and outlet must be radius type.
6) Omitting every other vane is prohibited.

d. Where smooth radius rectangular elbows are shown, they shall be constructed per SMACNA Figure 4-2. Type RE1 shall be constructed with a centerline duct radius R/W of 1.0. Where shown on drawings, Type RE3 elbows with 3 vanes shall be used with centerline duct radius R/W of 0.6 (SMACNA r/W=0.1). RE1 or RE3 elbows may be used where mitered elbows are shown if space permits. Mitered elbows (with or without turning vanes) may not be substituted for radius elbows. Do not make branch takeoffs within 4 duct diameters on the side of the duct downstream from the inside radius of radius elbows.
e. Rectangular branch and tee connections in ducts over 1" pressure class shall be 45° entry type per Figs. 4-5 and 4-6. Rectangular straight taps are not acceptable above 1" pressure class.
f. Bellmouth fittings shown on return duct inlets shall expand at a 60-degree total angle horizontally and vertically (space permitting) and have length of at least 25% of the smallest duct dimension.
g. Round taps off rectangular unlined ducts shall be flanged conical or bellmouth type (equal to Buckley Bellmouth or Sheet Metal Connectors E-Z Tap), or 45° rectangular with transition to round (equal to Sheet Metal Connectors Inc. High Efficiency Takeoff). Straight taps are acceptable if pressure class is 1" or less, round duct is 12" diameter or less, and the tap is not located between fans and TAB devices.
h. Duct offsets shall be constructed as shown on drawings. Additional offsets required in the field shall be formed of mitered elbows without turning vanes for offsets up to 30° maximum angle in accordance with SMACNA offset Type 2. Offsets of greater than 30° angle shall be formed of radius elbows with centerline radius R/W=1.0 or greater. SMACNA Type 1 offsets are not permitted.
i. All lined duct shall utilize dovetail joints where round or conical taps occur. The dovetail joints shall extend past the liner before being folded over.
j. Cushion heads are acceptable only downstream of TAB devices in ducts up to ± 2" pressure class, and must be less than 6" in length.
k. Slide-on flanged transverse joint systems are acceptable provided they are a manufactured product that has been tested for conformance with Chapter 2 of the SMACNA HVAC Duct Construction Standards for sheet and joint deflection at the specified pressure class.

1) Apply sealant to all inside corners. Holes at corners are not acceptable.
2) Manufacturers:

a) Ductmate Industries - 25/35/45
b) Nexus
c) Mez
d) WDCI
e) Other manufacturers must submit test data and fabrication standards and receive Architect/Engineer's approval before any fabrication begins.

l. Formed-on flanged transverse joint systems are acceptable provided they are a manufactured product that has been tested for conformance with Chapter 2 of the SMACNA HVAC Duct Construction Standards for sheet and joint deflection at the specified pressure class.

1) Apply sealant to all inside corners. Holes at corners are not acceptable.
2) Flanges shall be 24-gauge minimum (not 26 gauge).
3) Manufacturers:

a) Lockformer TDC
b) TDF
c) United McGill
d) Sheet Metal Connectors
e) Other manufacturers must submit test data and fabrication standards and receive Architect/Engineer's approval before any fabrication begins.

B. Round and Flat Oval Spiral Seam Ductwork - Single Wall:

1. Conform to applicable portions of Rectangular Duct Section. Round or flat oval ductwork may be substituted for rectangular ductwork where approved by the Architect/Engineer. The spiral seam ductwork shall meet the standards set forth in this specification. The ductwork shall meet or exceed the specified cross-sectional area and insulation requirements. The substitution shall be coordinated with all other trades prior to installation.

2. Flat oval duct in negative pressure applications shall have flat sides reinforced as required for rectangular ducts of the same gauge with dimensions equal to the flat span of the oval duct.
3. 90° elbows shall be smooth radius or have a minimum of five sections with mitered joints and R/D of at least 1.5.
4. Duct and fittings shall meet the required minimum gauges listed in chapter 3 of the SMACNA requirements for the specified pressure class. Ribbed and lightweight duct are not permitted.
5. Ductwork shall be suitable for velocities up to 5,000 fpm.
6. Divided flow fittings may be made as separate fittings or factory installed taps with sound, airtight, continuous welds at intersection of fitting body and tap.
7. Spot weld and bond all fitting seams in the pressure shell. Coat galvanizing damaged by welding with corrosion resistant paint to match galvanized duct color.
8. Ducts with minor axis less than 22" shall be spiral seam type. Larger ducts may be rolled, longitudinal welded seam type. SMACNA seams RL-2 and RL-3 are not permitted.
9. Reinforce flat oval ducts with external angles. Internal tie rods are permitted only as indicated for rectangular ductwork.
10. Transverse Joint Connections:

a. Crimped joints are not permitted.

b. Ducts and fittings 36" in diameter and smaller shall have slip joint connections. Size fitting ends to slip inside mating duct sections with minimum 2-inch insertion length and a stop bead. Use inside slip couplings for duct-to-duct joints, and outside slip couplings for fitting-to-fitting joints.
c. Ducts and fittings larger than 36" shall have flanged connections.
d. Secure all joints with at least 3 sheet metal screws before sealing.
e. Manufacturers, Slide-on Flanges:

1) Ductmate Industries - SpiralMate
2) Accuflange
3) Sheet Metal Connectors are acceptable.

f. Manufacturers, Self-Sealing Duct Systems:

1) Lindab
2) Ward "Keating Coupling"

2.2 MATERIAL AND APPLICATION SPECIFIC

A. Galvanized Steel:

1. General Requirements:

a. Duct and reinforcement materials shall conform to ASTM A653 and A924.
b. Interior Ductwork and reinforcements: G60 galvanized (0.60 ounces per square foot total zinc coating for two sides per ASTM A90) unless noted otherwise.
c. Exterior Ductwork: G90 galvanized (0.90 ounces per square foot total zinc coating for two sides per ASTM A90) unless noted otherwise. G60 is not acceptable for exterior use.
d. Ductwork reinforcement shall be of galvanized steel.

2. Duct Hangers and Support:

a. Ductwork supports shall be of galvanized or painted steel.
b. All fasteners shall be galvanized or cadmium plated.
c. Strap Hangers: Strap hanger shall be a minimum of 1 inch, 18 gauge galvanized steel attached to the bottom of ducts with spacing as required by SMACNA.

d. Cable Hangers:

1) Aircraft cable and slip cable hangers are acceptable for ducts up to 18" diameter. Protective sleeve tubing shall be used on the cable when supporting duct with exterior insulation. Corner saddles are required when supporting rectangular ductwork. Manufacturers; Supports:

a) Gripple
b) Ductmate
c) Duro Dyne
d) Architect/Engineer approved

2) Aircraft cable with 2-point support in standard horseshoe arrangement. Protective sleeve tubing shall be used on the cable when supporting duct with exterior insulation. 8'-0" OC and as required by CMC/UMC and SMACNA guidelines.

e. Integral Corner Connector Hanger: Integral hanger and corner assembly for use with TDC/TDF style duct flanges. Die stamped offset hanger connects to the flanged corner assembly. For use with aircraft cable or 1/4" or 3/8" diameter threaded rods. Tested to hold up to 1,400 lbs.. Install per manufacturer's ratings and instructions.

1) Manufacturers; Supports:

a) EZ Hanger

2.3 DUCTWORK REINFORCEMENT

A. All reinforcement shall be external to the duct except that tie rods may be used with the following limitations.

1. Ducts must be over 18" wide.
2. Duct dimensions must be increased 2" in one dimension (h or w) for each row of tie rods installed.
3. Tie rods must not exceed 1/2" diameter.
4. Manufacturer of tie rod system must certify pressure classifications of various arrangements, and this must be in the shop drawings.

2.4 DUCTWORK SEALANTS

A. One-part joint sealers shall be water-based mastic systems that meet the following requirements: maximum 48-hour cure time, service temperature of -20°F to +175°F, resistant to mold, mildew and water, flame spread rating below 25 and smoke-developed rating below 50 when tested in accordance with ASTM E84, suitable for all SMACNA seal classes and pressure classes. Mastic used to seal flexible ductwork shall be marked UL 181B-M.

B. Two-part joint sealers shall consist of a minimum 3" wide mineral-gypsum compound impregnated fiber tape and a liquid sealant. Sealant system shall meet the following requirements: maximum 48-hour cure time, service temperature of 0°F to 200°F, resistant to mold, mildew, and water, flame spread rating below 25 and smoke developed rating below 50 when tested in accordance with ASTM E84, suitable for all SMACNA seal classes and pressure classes.

C. Pressure sensitive tape used for sealing ductwork shall be minimum 2.5-inch wide, listed and marked UL 181A-P, having minimum 60 oz/inch peel adhesion to steel, and service temperature range from -20°F to +250°F.

D. Where pressure sensitive tape is called for on drawings and specifications for sealing flexible ductwork, tape shall be minimum 2.5-inch wide, UL 181 B-FX listed, and marked tape having minimum 60 oz/inch peel adhesion to steel and service temperature range from -20°F to +250°F.

1. Manufacturers, Pressure-Sensitive Tape:

    a. Venture Tape 1581A
    b. Compac #340
    c. Scotch Foil Tape 3326
    d. Polyken 339

2.5 FLEXIBLE DUCT

A. Flexible duct shall be listed and labeled as UL 181 Class 1 Air Duct Material, and shall comply with NFPA 90A and 90B, and meet GSA, FHA and other U.S. Government agency standards. Flexible duct shall bear the ADC Seal of Certification.

B. Flame Spread/Smoke Developed: Not over 25/50.

C. Stretch all flexible duct to prevent sags and reduce air friction. Shorten and reinstall all sagging or loose flexible duct. Avoid sharp elbows. Elbows shall maintain 1.5 diameter centerline turning radius.

D. Install per the SMACNA Flexible Duct Manual. Secure inner layer with draw band. Wrap with pressure sensitive tape for protection prior to installing draw band. Pressure sensitive tape alone is not acceptable.

E. Standard:

1. Flexible duct shall have corrosion-resistant wire helix, bonded to an inner liner that prevents air from contacting the insulation, covered with minimum 1-1/2", 3/4 lb/cf density fiberglass insulation blanket, sheathed in a vapor barrier of metalized polyester film laminated to glass mesh. .
2. Flexible duct shall have polymer wire helix, bonded to an inner liner that prevents air from contacting the insulation, covered with minimum 1-1/2" thick, 3/4 lb/cf density fiberglass insulation blanket, sheathed in a vapor barrier of polyester film laminated to glass mesh. Usage: MRI rooms.
3. Inner liner shall be airtight and suitable for 6" WC static pressure through 16" diameter. Outer jacket shall act as a vapor barrier only with permeance not over 0.1 perm per ASTM E96, Procedure A. "R" value shall not be less than 4.0 ft2*°F*hr/Btuh. Temperature range of at least 0-180°F. Maximum velocity of 4,000 fpm. "R" value shall not be less than 4.0 ft2*°F*hr/Btuh. Ducts in unconditioned spaces and ventilated attics: "R" value shall not be less than 6.0 ft2*°F*hr/Btuh.
4. Usage:

    a. Take-offs from supply ducts to inlets of terminal air boxes. Do not exceed 36" in length.
    b. Connections to air inlets and outlets. Do not exceed 5'-0" in length.

Dia	Length	63hz	125hz	250hz	500hz	1000hz	2000hz	4000hz
6" ø	6 ft	4.0	13	15	15	16	17	16
6" ø	3 ft	2.3	4.9	5.3	5.3	5.5	5.8	5.4
8" ø	6 ft	5.7	14	13	15	16	18	16

Dia	Length	63hz	125hz	250hz	500hz	1000hz	2000hz	4000hz
8" ø	3 ft	2.9	5.0	4.9	5.7	5.6	5.8	5.6
12" ø	6 ft	5.5	13	12	15	15	18	13
12" ø	3 ft	2.8	4.8	4.7	5.3	5.3	5.8	4.9

Dia	Length	63hz	125hz	250hz	500hz	1000hz	2000hz	4000hz
6" ø	6 ft	10	15	16	17	18	17	18
6" ø	3 ft	3.8	5.4	5.5	5.7	5.9	5.8	5.9
8" ø	6 ft	10	15	16	17	16	18	18
8" ø	3 ft	2.4	5.3	5.6	5.8	5.6	5.9	6.0
12" ø	6 ft	11	14	15	16	15	16	15
12" ø	3 ft	4.4	5.1	5.3	5.5	5.4	5.6	5.3

F. Radius Forming Elbows:

1. Flexible plastic radius forming elbow for use with flexible ducts to create 90deg elbow. One size for 6" to 16" diameter ducts. UL listed for return plenum spaces.
2. Usage: All supply air terminals with flexible ductwork connection.
3. Installation: Attach to flex duct and secure draw bands without crushing flex duct to form smooth radius elbow. Suspend radius forming elbow to structure. Install per manufacturer's instructions.
4. Acceptable Manufacturers:

    a. Hart & Cooley - Smartflow
    b. Thermaflex - Flexflow
    c. Titus - Flexright

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide openings in ducts for thermometers and controllers.

B. Locate ducts with space around equipment for normal operation and maintenance.

C. Do not install ducts or other equipment above electrical switchboards or panelboards. This includes a dedicated space extending 25 feet from the floor to the structural ceiling with width and depth equal to the electrical equipment. Unless intended to serve these rooms, do not install any ductwork or equipment in electrical rooms, transformer rooms, electrical closets, telephone rooms or elevator machine rooms.

D. Provide temporary closures of metal or taped polyethylene on open ducts to prevent dust from entering ductwork.

E. Supply ductwork shall be free of construction debris, and shall comply with Level "B" of the SMACNA Duct Cleanliness for New Construction Guidelines.

F. Repair all duct insulation and liner tears.

G. Install manual volume dampers in branch supply ducts so all outlets can be adjusted. Do not install dampers at air terminal device or in outlets, unless specifically shown.

H. Insulate terminal air box reheat coils. Seal insulation tight to form a tight vapor barrier.

I. Install flexible duct in accordance with the ADC Flexible Duct Performance and Installation Standards.

J. Flexible duct shall NOT be joined to flat-oval connections. Provide sheet metal oval-to-round transitions where required, to include, but not limited to, all connections to air inlets, air outlets, and terminal air boxes.

K. Install all exterior ductwork per SMACNA Fig. 6-3. Where drawings do not indicate otherwise, ductwork seams and joints shall be sealed watertight and pitched to shed water.

L. Support all duct systems in accordance with the SMACNA HVAC Duct Construction Standards: Metal and Flexible and the SMACNA Seismic Restraint Manual: Guidelines for Mechanical Systems, where applicable. Refer to Section 23 05 50 for seismic requirements.

M. Adhesives, sealants, tapes, vapor retarders, films, and other supplementary materials added to ducts, plenums, housing panels, silencers, etc. shall have flame spread/smoke developed ratings of under 25/50 per ASTM E84, NFPA 255, or UL 723.

N. All duct support shall extend directly to building structure. Do not support ductwork from pipe hangers unless coordinated with piping contractor prior to installation. Do not allow lighting or ceiling supports to be hung from ductwork or ductwork supports.

3.2 DUCTWORK APPLICATION SCHEDULE

A. General:

1. Seal Class is per SMACNA HVAC Air Duct Leakage Test Manual
2. Insulation:

    a. Refer to Section 23 07 13 for insulation types.
    b. Type A insulation (Flexible Fiberglass Wrap) R-values noted are based on installed values (25% compression).

3. Note 1: Apply aluminum based adhesive sealant tape at non-flanged joints on ducts serving dedicated outside air supply (DOAS) and exhaust system in addition to Class A sealant.
4. Note 2: Apply aluminum based adhesive sealant tape on TAB boxes (all seams and joints of the box and duct connections) serving dedicated outside air supply (DOAS) system.

B. Supply Duct from Fan to Terminal Air Boxes - Single Wall:

1. Shape:

    a. Rectangular Duct - Single Wall
    b. Round and Flat Oval Spiral Seam Ductwork - Single Wall

2. Material: Galvanized Steel
3. Pressure Class: +3"
4. Seal Class: A
5. Insulation:

    a. IECC-2021: 1-1/2" thick Type A (R=4.5)

6. Additional Requirements: None

C. Supply Duct from Fan to Terminal Air Boxes - Single Wall:

1. Shape:

    a. Rectangular Duct - Single Wall
    b. Round and Flat Oval Spiral Seam Ductwork - Single Wall

2. Material: Galvanized Steel
3. Pressure Class: +3"
4. Seal Class: A
5. Insulation:

    a. IECC-2021: 1-1/2" thick Type A (R=4.5)

6. Additional Requirements: None

D. Exterior Supply Duct from Fan to Terminal Air Boxes - Single Wall with Stainless Steel:

1. Shape:

    a. Rectangular Duct - Single Wall
    b. Round and Flat Oval Spiral Seam Ductwork - Single Wall

2. Material: Galvanized Steel
3. Pressure Class: +3"
4. Seal Class: A
5. Insulation:

    a. ASHRAE 90.1-2019: 2" thick Type B (R=8) with stainless steel (R=8.0)
    b. IECC-2021: 2" thick Type B (R=8) with stainless steel (R=8)

6. Additional Requirements: Provide aluminum jacket over all exterior ductwork.

E. Supply Duct from Terminal Air Boxes to Outlets:

1. Shape:

    a. Rectangular Duct - Single Wall
    b. Round and Flat Oval Spiral Seam Ductwork - Single Wall

2. Material: Galvanized Steel
3. Pressure Class: +2"
4. Seal Class: A
5. Insulation:

    a. ASHRAE 90.1-2019: 1-1/2" thick Type A (R=4.5)
    b. IECC-2021: 1-1/2" thick Type A (R=4.5)

6. Additional Requirements: None

F. Return Duct:

1. Shape:

    a. Rectangular Duct - Single Wall
    b. Round and Flat Oval Spiral Seam Ductwork - Single Wall

2. Material: Galvanized Steel
3. Pressure Class: -2"
4. Seal Class: A
5. Insulation:

    a. ASHRAE 90.1-2019: None

6. Additional Requirements: None

G. Exterior Return Duct:

1. Shape:

    a. Rectangular Duct - Double Wall
    b. Round and Flat Oval Spiral Seam Ductwork - Double Wall

2. Material: Galvanized Steel
3. Pressure Class: -2"
4. Seal Class: A
5. Insulation:

    a. ASHRAE 90.1-2019: 2" thick Type B (R=6)
    b. IECC-2021: 2" thick Type B (R=6)

6. Additional Requirements: None

H. General Exhaust Duct:

1. Shape:

a. Rectangular Duct - Single Wall
b. Round and Flat Oval Spiral Seam Ductwork - Single Wall

2. Material: Galvanized Steel
3. Pressure Class: -1"
4. Seal Class: A
5. Insulation: None
6. Additional Requirements: None

I. Transfer Ducts:

1. Shape:

a. Rectangular Duct - Single Wall
b. Round and Flat Oval Spiral Seam Ductwork - Single Wall

2. Material: Galvanized Steel
3. Pressure Class: -1/2"
4. Insulation: 1" thick Type C (R=3.6)

J. Ductwork Accessories (Fabric Flex Connectors, Equipment Flanges, etc.):

1. Insulation:

a. ASHRAE 90.1-2019: 1-1/2" thick Type A (R=4.5)
b. IECC-2021: 1-1/2" thick Type A (R=4.5)

K. All Terminal Air Box/ Reheat Coil Headers and Duct Mounted Coil Headers:

1. Insulation: 1-1/2" thick Type A (R=4.5)

L. Linear Diffuser Supply Plenum:

1. Insulation:

a. ASHRAE 90.1-2019: 1/2" thick Type C (R=1.8)
b. IECC-2021: 1/2" thick Type C (R=1.8)

3.3 DUCTWORK SEALING

A. General Requirements:

1. Openings, such as rotating shafts, shall be sealed with bushings or similar.
2. Pressure sensitive tape shall not be used as the primary sealant unless it has been certified to comply with UL-181A or UL-181B by an independent testing laboratory and the tape is used in accordance with that certification.

3. All connections shall be sealed including, but not limited to, taps, other branch connections, access doors, access panels, and duct connections to equipment. Sealing that would void product listings is not required. Spiral lock seams need not be sealed.
4. Mastic-based duct sealants shall be applied to joints and seams in minimum 3 inch wide by 20 mil thick bands using brush, putty knife, trowel, or spray, unless manufacturer's data sheet specifies other application methods or requirements.

B. All ducts systems, regardless of pressure class, shall be Seal Class A as defined by Section 5-1 of SMACNA HVAC Air Duct Leakage Test Manual per the Energy Code, unless specifically noted otherwise. Seal Class A shall include sealing of all transverse joints, longitudinal seams, and duct wall penetrations with welds, gaskets, mastics, or fabric-embedded mastic system. Joints are inclusive of, but not limited to, girth joints, branch and sub-branch intersections, duct collar tap-ins, fitting subsections, louver and air terminal connections to ducts, access door and access panel frames and jambs, duct, plenum, and casing abutments to building structures.

3.4 TESTING

A. Interior Duct - Less than 3" WG (positive or negative):

1. Leak testing of these pressure classes is not normally required for interior ductwork (inside the building envelope). However, leak tests will be required if, in the opinion of the Architect/Engineer, the leakage appears excessive. All exterior ductwork shall be tested. If duct has outside wrap, testing shall be done before it is applied.
2. Leak test shall be at the Contractor's expense and shall require capping and sealing all openings.
3. Seal ducts to bring the air leakage into compliance.
4. Contractor shall notify the Architect/Engineer five business days prior to pressurizing ductwork for testing.

B. Interior Duct - 3" WG and Above (positive or negative):

1. A minimum of 25% of interior ductwork (inside the building envelope) shall be tested. The Owner or designated representative shall select the sections to be tested. If duct has outside wrap, testing shall be done before it is applied.
2. Leak test shall be at the Contractor's expense and shall require capping and sealing all openings.
3. Seal ducts to bring the air leakage into compliance.
4. Contractor shall notify the Architect/Engineer five business days prior to pressurizing ductwork for testing.

C. Exterior Duct - 1/2" WG and Above (positive or negative):

1. All exterior ductwork (outside the building envelope) shall be completely pressure tested. If duct has outside wrap, testing shall be done before it is applied.
2. Leak test shall be at the Contractor's expense and shall require capping and sealing all openings.
3. Seal ducts to bring the air leakage into compliance.

4. Contractor shall notify the Architect/Engineer five business days prior to pressurizing ductwork for testing.

D. Test Procedure:

1. Testing shall be as listed in the latest edition of the SMACNA HVAC Duct Leakage Manual, with the following additional requirements:

   a. The required leakage class for Seal Class A, rectangular ducts, shall be 4; round shall be 2.
   b. Test pressure shall be the specified duct pressure class. Testing at reduced pressures and converting the results mathematically is not acceptable. This is required to test the structural integrity of the duct system.
   c. If any leak causes discernible noise at a distance of 3 feet, that leak shall be eliminated, regardless of whether that section of duct passed the leakage test.
   d. All joints shall be felt by hand, and all discernible leaks shall be sealed.
   e. Totaling leakage from several tested sections and comparing them to the allowable leakage for the entire system is not acceptable. Each section must pass the test individually.
   f. Contractor shall notify the Architect/Engineer five business days prior to pressurizing ductwork for testing. Failure to notify the Architect/Engineer of pressure testing may require the contractor to repeat the duct pressure test after proper notification.
   g. Upon completion of the pressure test, the contractor shall submit an air duct leakage test summary report as outlined in the SMACNA HVAC Duct Leakage Test Manual.
   h. All access doors, taps to terminal air boxes, and other accessories and penetrations must be installed prior to testing. Including terminal air boxes in the test is not required.
   i. Positive pressure leakage testing is acceptable for negative pressure ductwork.

3.5 DUCTWORK PENETRATIONS

A. All duct penetrations of firewalls shall have fire or fire/smoke dampers where required by code.

B. Dampers shall be compatible with fire rating of wall assembly. Verify actual rating of any wall being penetrated with Architect/Engineer.

C. Seal all duct penetrations of walls that are not fire rated by caulking or packing with fiberglass. Install trim strip to cover vacant space and raw construction edges of all openings in finished rooms. Install escutcheon ring at all round duct openings in finished rooms. Trim strips and rings shall be same material and finish as exposed duct.

3.6 PAINTING

A. Paint interior of ducts black within twice the largest duct dimension of inlets and outlets where interior of duct is visible.

B. Paint bottom of ducts black within twice the largest duct dimension where a duct is routed above an unducted perforated grille and the duct is visible.

END OF SECTION 23 31 00

SECTION 23 33 00 - DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Manual Volume Dampers.

B. Fire Dampers.

C. Fire/Smoke Dampers.

D. Pressure Relief Doors.

E. Backdraft Dampers.

F. Fabric Connectors.

G. Duct Access Doors.

H. Duct Test Holes.

I. Remote Volume Control Devices.

1.2 SUBMITTALS

A. Submit shop drawings under provisions of Section 23 05 00.

B. Submit manufacturer's installation instructions.

C. Submit certification that ductwork accessories will withstand seismic forces defined in Section 23 05 50. Include the following:

1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

PART 2 - PRODUCTS

2.1 MANUAL VOLUME DAMPERS

A. Fabricate in accordance with SMACNA Duct Construction Standards, and as indicated.

B. Fabricate single blade dampers for duct sizes to 9-1/2 x 30 inches.

C. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12" x 72". Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

D. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide molded synthetic or oil-impregnated nylon or sintered bronze bearings.

E. Provide locking quadrant regulators on single and multi-blade dampers.

F. On insulated ducts, mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

G. If blades are in open position and extend into the main duct, mount damper so blades are parallel to airflow.

2.2 DYNAMIC CURTAIN BLADE FIRE DAMPERS (FD)

A. Furnish and install fire dampers in ducts, where shown on the drawings, at the point where they pass through a fire wall or a floor and in all other locations required by the local fire department, The National Fire Protection Association's Pamphlet No. 90A and all other applicable codes.

B. Fire dampers shall be UL 555 listed for 1-1/2-hour fire resistance unless noted otherwise, dynamic rated with heated airflow at 2,000 fpm and 4" WC, and have all blades stacked out of the airstream (Type B).

C. Where dampers are in aluminum or stainless steel duct, provide stainless steel dampers.

D. Fire dampers shall be held open by a fusible link rated at 165°F unless otherwise called for on the drawings or by local codes.

E. Dampers shall be installed in sleeves of sufficient thickness to comply with the UL555 Standard for Safety Fire Dampers listing of the damper. Where UL555 permits sleeve thickness to be the same as that of the duct gauge, such thickness shall not be less than that specified in NFPA 90A for breakaway style sleeves. If a breakaway style duct/sleeve connection is not used, the sleeve shall be a minimum of 16 gauge for dampers up to 36" wide by 24" high and 14 gauge for dampers exceeding 36" wide by 24" high. Damper sleeve shall not extend more than 6" beyond the firewall or partition unless damper is equipped with a factory installed access door. Sleeve may extend up to 16" beyond the firewall or partition on sides equipped with the factory installed access door.

F. Maximum Curtain Damper Size (Multi-section) at less than 2,000 fpm:

1. Vertical Installation: 72"w x 48"h or 48"w x 72"h or 120"w x 24"h.
2. Horizontal Installation: 36"w x 48"h or 48"w x 36"h.

G. Maximum Curtain Damper Size at greater than 2,000 fpm: Vertical or horizontal - 24"w x 24"h.

H. Locate access door in the ductwork for visual inspection and on the latch side to replace link easily. Each access door shall have a label with letters at least 1/2" high, reading "FIRE DAMPER".

2.3 DYNAMIC MULTIPLE BLADE FIRE DAMPERS (FD)

A. General:

1. Furnish and install control/fire/smoke dampers in ducts, where shown on the drawings, at the point where they pass through a fire/smoke partition and in all other locations required by the local Fire Department, the National Fire Protection Association Pamphlet No. 90A, and all other applicable codes.
2. Fire Resistance Rating: Assemblies shall be 1-1/2 hour rated under UL Standard 555 unless noted otherwise on drawings.
3. Airflow Rating: Dynamic rated at 2,000 fpm and 4" WC.
4. Temperature Rating: Assemblies shall be UL 555S listed for use in smoke control system with a 250°F temperature rating.
5. Leakage Rating: Class II. Shall not leak over 20 cfm per square foot at 4" WC (Class II).
6. Where dampers are in aluminum or stainless steel duct, provide stainless steel dampers.

B. Construction:

1. Frame: 5 inches x minimum 16 gauge roll formed, galvanized steel hat-shaped channel, reinforced at corners.

2. Sleeve: Dampers shall be installed in sleeves of sufficient thickness to comply with UL555 Standard for Safety Fire Dampers listing of the damper. Where UL555 permits sleeve thickness to be the same as that of the duct gauge, such thickness shall not be less than that specified in NFPA 90A for breakaway style sleeves. If a breakaway style duct/sleeve connection is not used, the sleeve shall be a minimum of 16 gauge for dampers up to 36" wide by 24" high and 14 gauge for dampers exceeding 36" wide by 24" high. Damper sleeve shall not extend more than 6" beyond the firewall or partition unless damper is equipped with an actuator or factory installed access door. Sleeve may extend up to 16" beyond the firewall or partition on sides equipped with the actuator or factory installed access door.
3. Blades: Opposed blade; airfoil-shaped, single piece, minimum 14 gauge double skin. Galvanized steel. Maximum 6" damper blades.
4. Seals: Blade seal shall be silicone fiberglass material to maintain smoke leakage rating to minimum of 450°F and galvanized steel for flame seal to 1,900°F. Seal to be mechanically attached to blade edge. Jam seal shall be stainless steel, flexible metal compression type.
5. Bearings: Self-lubricating stainless-steel sleeve, in extruded hole in frame.
6. Axle: Minimum 1/2" plated steel, hex shaped, mechanically attached to blade.

C. Fusible Link: Fire dampers shall be held open by a fusible link rated at 165°°F unless otherwise called for on the drawings or by local codes.

D. Maximum Multi-Blade Size (Multiple Section) at 2,000 fpm and 4" WC:

1. Vertical Installation: 120"w x 48"h or 64"w x 96"h.
2. Horizontal Installation: 120"w x 48"h or 60"w x 96"h.

E. Access Door: Locate access door in the ductwork for visual inspection and on the latch side to replace link easily. Each access door shall have a label with letters at least 1/2" high, reading "FIRE DAMPER".

2.4 FIRE/SMOKE DAMPERS (FSD)

A. General:

1. Furnish and install fire/smoke dampers in ducts, where shown on the drawings, at the point where they pass through a fire/smoke partition and in all other locations required by the local Fire Department, the National Fire Protection Association Pamphlet No. 90A, UL 2043, and all other applicable codes.
2. Fire Resistance Rating: Assemblies shall be 1-1/2 hour rated under UL Standard 555 unless noted otherwise on drawings.
3. Airflow Rating: Dynamic rated at 2,000 fpm and 4" WC.
4. Temperature Rating: Assemblies shall be UL 555S listed for use in smoke control system with a 250°F temperature rating.
5. Leakage Rating: Class II. Shall not leak over 20 cfm per square foot at 4" WC.
6. FSD dampers shall be furnished complete with factory-mounted actuators, and the damper/operator assemblies shall meet all requirements listed below.
7. Where dampers are located in aluminum or stainless steel duct, provide stainless steel dampers.

8. The complete assembly must be factory assembled, cycled and tested prior to shipment.
9. All operators shall be located with easy access for servicing.
10. Contractor to field verify actuator installation and clearance requirements prior to ordering. Actuator should not be taller than duct height. Rotate or turn over the actuator if this is the case.

B. Construction:

1. Frame: 5 inches x minimum 16 gauge roll formed, galvanized steel hat-shaped channel, reinforced at corners.
2. Sleeve: Dampers shall be installed in sleeves of sufficient thickness to comply with UL555 Standard for Safety Fire Dampers listing of the damper. Where UL555 permits sleeve thickness to be the same as that of the duct gauge, such thickness shall not be less than that specified in NFPA 90A for breakaway style sleeves. If a breakaway style duct/sleeve connection is not used, the sleeve shall be a minimum of 16 gauge for dampers up to 36" wide by 24" high and 14 gauge for dampers exceeding 36" wide by 24" high. Damper sleeve shall not extend more than 6" beyond the firewall or partition unless damper is equipped with an actuator or factory installed access door. Sleeve may extend up to 16" beyond the firewall or partition on sides equipped with the actuator or factory installed access door.
3. Blades: Opposed blade; airfoil-shaped, single piece, minimum 14 gauge double skin. Galvanized steel. Maximum 6" damper blades.
4. Seals: Blade seal shall be silicone fiberglass material to maintain smoke leakage rating to minimum of 450°F and galvanized steel for flame seal to 1,900°F. Seal to be mechanically attached to blade edge. Jam seal shall be stainless steel, flexible metal compression type.
5. Bearings: Self-lubricating stainless-steel sleeve, in extruded hole in frame.
6. Axle: Minimum 1/2" plated steel, hex shaped, mechanically attached to blade.

C. Fusible Link: Fire dampers shall be held open by a fusible link rated at 165°°F unless otherwise called for on the drawings or by local codes.

D. Electric Actuator: Externally mounted, electric direct coupled. Actuator shall be 120V. Wiring by Electrical Contractor. Overload protections shall be either microprocessor or electronic-based motor controller providing burnout protection if stalled before full rotation is reached. The actuator shall electronically cut off at full open to eliminate noise generation. Actuator shall be mounted by means of a V-bolt dual nut clamp with a V-shaped toothed cradle. Aluminum clamps or setscrews are not acceptable. "Stall type" actuators are NOT acceptable. Actuator shall carry a manufacturer’s 5 year warranty. Fail to closed position. Integral auxiliary switches shall be provided on all actuators as required.

E. Access Door: Locate access door in ductwork for visual inspection and on the latch side to replace link easily. Each access door shall have a label with letters at least 1/2" high reading "FIRE/SMOKE DAMPER".

2.5 PRESSURE RELIEF DOORS

A. Furnish and install pressure relief doors where shown on the drawings. Doors shall be installed to open outward to relieve pressure build-up or to open inward to prevent damage to negative pressure.

B. Door and frame shall be constructed of 12 gauge galvanized steel, with polyurethane foam seal around the door perimeter. A sign warning of the possibility that the door could open suddenly should be placed on the side of the door that swings outward.

C. The door shall be factory set to open at 4 inches W.C. static pressure. The relief pressure shall be factory set and tested in an AMCA approved lab prior to shipment.

D. The door shall automatically reset after pressure drops below 3" W.C.

E. Leakage shall not exceed 40 CFM at 4" W.C.

F. Manufacturer:

1. Ruskin
2. Kees
3. Arrow

2.6 BACKDRAFT DAMPERS

A. Gravity backdraft dampers, size 18 inches x 18 inches or smaller, furnished with air moving equipment, may be air moving equipment manufacturer's standard construction.

B. Fabricate multi-blade, parallel action gravity balanced backdraft dampers of extruded aluminum, with blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90° stop, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

C. Models:

1. Ruskin CBD4
2. Arrow 655
3. Safe-Air/Dowco BRL
4. Greenheck EM.

2.7 FABRIC CONNECTORS

A. Fabric connectors shall be installed between all fans or fan units and metal ducts or casings to prevent transfer of fan or motor vibration.

B. The fabric connectors shall be completely flexible material which shall be in folds and not drawn tight.

C. Fabric connectors shall be of glass fabric double coated with neoprene, with UL approval. Weight = 30 oz. per square yard minimum. Fabric shall not be affected by mildew and shall be absolutely waterproof, airtight and resistant to acids, alkalis, grease and gasoline, and shall be noncombustible.

D. Fabric connections shall not exceed 6" in length on ductwork that has a positive pressure. On ductwork that has a negative pressure, the length shall not exceed 2" in length.

E. All corners shall be folded, sealed with mastic and stapled on 1" centers.

F. Fabric connectors shall not be painted.

G. Unless otherwise shown on the drawings, the fabric connection at the inlet to centrifugal fans shall be at least one duct diameter from the fan to prevent inlet turbulence.

H. Materials:

1. Durodyne MFN-4-100
2. Vent Fabrics, Inc.
3. "Ventglas"
4. Proflex PFC3NGA

I. Fabric connectors exposed to sunlight and weather shall be as described above, except the coating shall be hypalon in lieu of neoprene.

J. Materials:

1. Durodyne "Duralon MFD-4-100"
2. Vent Fabrics, Inc.
3. "Ventlon"
4. Proflex PFC3HGA

2.8 DUCT ACCESS DOORS

A. Fabricate per Fig. 7-2 and 7-3 of the SMACNA HVAC Duct Construction Standards and as indicated.

B. Review locations prior to fabrication. Install access doors at fire dampers, smoke dampers, motorized dampers, fan bearings, filters, automatic controls, humidifiers, louvers, duct coils and other equipment requiring service inside the duct.

C. Construction shall be suitable for the pressure class of the duct. Fabricate rigid, airtight, and close-fitting doors of materials identical to adjacent ductwork with sealing gaskets butt or piano hinges, and quick fastening locking devices. For insulated ductwork, install minimum one inch thick insulation with sheet metal cover.

D. Access doors with sheet metal screw fasteners are not acceptable.

E. Minimum size for access doors shall be 24" x 16" or full duct size, whichever is less.

F. Provide duct access door in all horizontal return ductwork at 20 foot intervals per NFPA 90A.

G. Fire Damper, Fire/Smoke Damper Access Provide quantity of access doors such that two hands can fit inside ductwork to manually reset fire dampers. For ducts larger than 12x12 , provide one access door. For ducts 12" x 12" and smaller, provide one access door on bottom and one on side.

2.9 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.10 DUCTWORK ACCESSORY SEALANTS

A. Ductwork accessory sealants and adhesives shall conform to Section 23 31 00.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Installation Requirements:

1. Install accessories in accordance with manufacturer's instructions.
2. Where duct access doors are located above inaccessible ceilings, provide ceiling access doors. Coordinate location with the Architect/Engineer.
3. Coordinate and install access doors provided by others.
4. Provide access doors for all equipment requiring maintenance or adjustment above an inaccessible ceiling. Minimum size shall be 24" x 24".
5. Provide duct test holes where indicated and as required for testing and balancing purposes.

B. Manual Volume Damper:

1. Provide manual volume dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts where indicated on drawings and as required for air balancing. Use splitter dampers only where indicated.
2. Provide ceiling access doors for manual volume dampers. When manual volume dampers are located above an inaccessible ceiling and an access door cannot be installed, provide a remote-controlled volume control device for operation of the damper. Coordinate location with the Architect/Engineer.

C. Fire Damper, Fire Smoke Damper, Smoke Damper:

1. Installation:

a. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves and duct connections.
b. Provide ceiling access doors for smoke and/or fire dampers. Coordinate location with the Architect/Engineer.
c. Provide manufacturer's maintenance instructions to Owner.
d. At fire dampers, smoke dampers and combination fire smoke damper where duct is:

1) Internally insulated, exterior duct wrap shall be installed from the wall out to 1 foot from the wall. All edges shall be taped.
2) Externally insulated, the exterior duct wrap shall extend up to the wall.

2. Commissioning/Testing and Acceptance:

a. Dampers shall be tested for function in their installed condition. Cycle all dampers to ensure proper operation and signal reporting as required by the manufacturer, building codes, and NFPA, with the minimum following requirements:

1) Visually inspect damper to ensure they are free from obstructions, have appropriate access, and are labeled.
2) Demonstrate resetting of fire dampers to Authorities Having Jurisdiction and Owner's representative as described below.
3) Fusible Link Operated Dampers:

a) Ensure fan is off.
b) With damper full-open, remove fusible link.
c) Ensure damper closes completely without assistance.
d) Return damper to full-open position and replace fusible link.

4) Dampers with Position Indication Wired to Indication Lights, Control Panels or BAS:

a) Confirm damper is full-open using position indicator signal.
b) Remove power to allow spring return to close damper.
c) Confirm damper is full-closed using position indicator signal.
d) Reapply power to reopen damper.
e) Confirm damper is full-open using position indicator signal.

5) Dampers without Position Indication:

a) Visually confirm damper is full-open using position indicator signal.

b) Remove power to allow spring return to close damper.
c) Visually confirm damper is full-closed.
d) Reapply power to reopen damper.
e) Visually confirm damper is full-open.

3. Report:

a. Provide Commissioning/Testing and Acceptance Report documenting the following for all fire damper, fire smoke damper, smoke dampers.
b. A copy of the report shall be filed with the fire code official and an identical copy shall be maintained in an approved location at the building.
c. Report shall include the following:

1) Damper ID#
2) System identification (e.g. AHU-#)
3) Type (FD, FSD, SD)
4) Duct size
5) UL assembly number
6) Location of damper and access door
7) Location of position indicator
8) Fusible link temperature rating (if applicable)
9) Manufacturer and model
10) Commissioning testing and acceptance operation: Pass/Fail/Reset

D. Control Dampers and Damper Actuators:

1. Install control dampers and damper actuators in accordance with manufacturer's instructions and in coordination with the Temperature Control Contractor.
2. Seal around damper frame inside ductwork with duct sealant to prevent bypass around damper.
3. Provide duct access door at each control damper.

END OF SECTION 23 33 00

SECTION 23 34 16 - CENTRIFUGAL FANS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. In-line Centrifugal Fans.

B. Performance Ratings: Bear the AMCA Certified Rating Seal - Air Performance.

C. Fabrication: Conform to AMCA 99.

D. Fan Energy Index (FEI): Fans shall meet or exceed the minimum FEI scheduled at the specified airflow, pressure, and air density (duty point). In no case shall the FEI at the specified duty point fall below 1.0.

1.2 SUBMITTALS

A. Submit shop drawings per Section 23 05 00. Include data on all fans and accessories. Submit sound power levels for both fan inlet and outlet at rated capacity. Submit motor ratings and electrical characteristics, plus motor and electrical accessories. Submit multi-speed fan curves including minimum and maximum fan speed with specified operating points clearly plotted. Submit the Fan Energy Index (FEI) at the selected duty point.

B. Submit operation and maintenance data. Include instructions for lubrication, motor and drive replacement, and spare parts list.

C. Submit certification that centrifugal fans, accessories, and components will withstand seismic forces defined in Section 23 05 50. Include the following:

1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.3 EXTRA STOCK

A. Provide one extra belt set for each fan unit.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust.

PART 2 - PRODUCTS

2.1 IN-LINE CENTRIFUGAL FAN

A. Galvanized steel construction with stainless steel or cadmium plated fasteners and galvanized steel belt guard.

B. Backward inclined, non-overloading, all aluminum wheel and hub. Dynamically balanced.

C. Cast iron, adjustable pitch sheaves. V-belt drive sized for 1.5 of maximum horsepower. Operating point near center of adjustment range.

D. Screw adjustment belt tightener.

E. Regreasable bearings rated for 40,000 hour B-10 life at specified operating point. Extend lubrication lines outside of housing.

F. Steel mounting brackets suitable for any mounting position.

G. Motor per the drawings and Section 23 05 13. Minimum 1/3 HP motors for all fans.

H. Factory installed and wired disconnect switch.

I. Manufacturers:

1. Jenco Fan
2. Carnes
3. Cook
4. PennBarry
5. Greenheck

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Installation Requirements:

1. Do not operate fans for any purpose until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.
2. Install flexible connections between fan and ductwork. Install metal bands of connectors parallel with minimum 1" flex between ductwork and fan while running.
3. Provide safety screen where inlet or outlet is exposed. Screens shall meet OSHA regulations for size of openings.

B. Fume Exhaust Fan:

1. Each fume exhaust fan shall have a 3/8" diameter hole drilled in one of its base rails for electrical grounding. Scrape away paint near the hole for good grounding.

END OF SECTION 23 34 16

SECTION 23 34 23 - POWER VENTILATORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Roof Exhaust Fan.

B. Rooftop Fan Curbs.

C. In-Line Cabinet Fan.

1.2 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210 and bear AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300.

C. Fabrication: Conform to AMCA 99.

D. Fan Energy Index (FEI): Fans shall meet or exceed the minimum FEI scheduled at the specified airflow, pressure, and air density (duty point). In no case shall the FEI at the specified duty point fall below 1.0.

1.3 SUBMITTALS

A. Submit shop drawings per Section 23 05 00. Include data on all fans and accessories. Submit sound power levels for both fan inlet and outlet at rated capacity. Submit motor ratings and electrical characteristics, plus motor and electrical accessories. Submit multi-speed fan curves including minimum and maximum fan speed with specified operating points clearly plotted. Submit the Fan Energy Index (FEI) at the selected duty point (ceiling and HVLS fans are exempt from FEI submittal requirements).

B. Submit manufacturer's installation instructions.

C. Submit electrical power/controls wiring diagrams and product data indicating general assembly, components, safety controls, and service connections.

D. Submit certification that power ventilators, accessories, and components will withstand seismic forces defined in Section 23 05 50. Include the following:

1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.4 EXTRA STOCK

A. Provide one (1) extra belt set for each fan unit.

PART 2 - PRODUCTS

2.1 IN-LINE CABINET FAN

A. Fiberglass lined, sheet metal housing, arranged for in-line installation.

B. Rubber torsion motor mounts.

C. Manual Motor Starter: NEMA ICS 2; AC general-purpose Class A manually operated non-reversing full-voltage controller for fractional horsepower induction motors, with thermal overload relay, toggle operator.

D. Built-in backdraft damper.

E. Centrifugal fan.

F. Provide variable speed controller if shown on the drawings.

G. Manufacturers:

1. ACME
2. Broan
3. Carnes
4. Cook
5. Jenco
6. PennBarry
7. Greenheck
8. Soler-Palau
9. York

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated lag screws to roof curb.

C. If manufacturer has no recommendations, secure roof exhaust fans to curbs with 1/4" lag bolts on 8" maximum centers.

D. MC shall install and wire factory provided damper to open when the fan runs if the manufacturer does not provide an option to pre-wire the damper.

END OF SECTION 23 34 23

SECTION 23 36 00 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Single Duct Variable Air Volume Terminal Box.

1.2 SUBMITTALS

A. Submit shop drawings under provisions of Section 23 05 00.

B. Submit shop drawings indicating configuration, general assembly, and materials used in fabrication.

C. Submit product data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings which indicate airflow, static pressure, and NC designation.

D. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of one to 4 inch WG.

E. Submit electrical power/controls wiring diagrams and product data indicating general assembly, components, safety controls, and service connections.

F. Submit manufacturer's installation instructions.

G. Submit certification that all air terminal units, accessories, and components will withstand seismic forces defined in Section 23 05 50. Include the following:

1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculation.
    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.3 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists.

C. Include directions for resetting constant volume regulators.

PART 2 - PRODUCTS

2.1 ACOUSTICAL CONSIDERATIONS (THIS APPLIES TO ALL UNITS)

A. All units shall have noise data certified in accordance with AHRI Standard 885-98 with 5/8" 20-lb. density mineral fiber ceiling tile and shall not produce space noise values over NC-35 due to radiated and airborne noise combined. Acoustical considerations shall take priority over sizes noted in schedule. It is the manufacturer's responsibility to increase inlet size to meet acoustic levels scheduled.

2.2 SINGLE DUCT VARIABLE AIR VOLUME TERMINAL BOX

A. Casing: Minimum 22 gauge galvanized steel.

1. Fully insulated with 3/4" elastomeric closed cell insulation liner. Insulation shall be UL listed and meet NFPA 90A requirements.

a. Usage: All supply air systems.

B. Damper Blade: Extruded aluminum or minimum 18 gauge galvanized steel. Nylon or bronze bushings on damper shafts. Dampers shall seal against gasketed stops. Leakage shall not exceed 4% of unit nominal cfm at 3.0 inches WG inlet static pressure.

C. Inlet Flow Sensor: Provide "cross" • or "ring• " style velocity and static sensor at inlet to box for use by unit controller.

D. Damper Operators: Electronic. Furnish all mounting brackets, relays, and linkages. Provided by the TCC and installed by the manufacturer. Refer to Section 23 09 00 for additional information.

1. Operator shall be UL listed, electronic direct coupled with spring return to normal position for modulating or two-position control as noted in the sequence of control. Actuator shall be 24 VAC with proportional control, electronic overload protection to prevent actuator damage due to over-rotation and "V" bolt clamp with matching "V" toothed cradle (single bolt or setscrew fasteners not acceptable).

E. Electronic Volume Regulator/Controller: Provided by the TCC and installed by the manufacturer. Refer to Section 23 09 00 for additional information. Boxes shall have pressure independent control to maintain constant air volume regardless of duct pressure changes up to 6 inches w.c. and shall be accurate down to 0.004" velocity pressure. Set boxes for maximum and minimum settings shown on the drawings.

F. Electric Heating Coil: Open nichrome type electric resistance coils, automatic reset thermal cutout primary safety device, manual reset thermal cutout secondary safety device, airflow switch interlock, disconnect switch on face of integral control panel, magnetic contactors, 24-volt control, control voltage transformer and fusing, pressure-electric switch for two- - multi-stage step SCR control. Capacity and voltage shall be as scheduled on the drawings.

G. Boxes shall not exceed the static pressure drop and N.C. level scheduled on the drawings. It is the manufacturer's responsibility to increase inlet size to meet pressure drop and N.C. levels scheduled.

H. Refer to control diagrams and notes on control drawings for complete sequence of control.

I. Manufacturers:

1. Carrier
2. Titus
3. Trane
4. Krueger
5. Carnes
6. E.H. Price
7. Tuttle & Bailey
8. Nailor
9. Enviro-Tec
10. Johnson Controls Inc.
11. Metalaire.
12. Anemostat.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Maintain minimum working clear space for all electrical connections in accordance with NFPA 70, National Electrical Code.

C. Provide ceiling access doors or locate units above easily removable ceiling components.

D. Support units individually from structure. Do not support from adjacent ductwork.

E. Where boxes are located adjacent to a wall or joist, the damper motors and control valves shall be located on the side of the box away from the wall or joist to permit easy access.

F. Comb fins on coils to repair bent fins.

G. Insulate terminal air box hydronic reheat coils to prevent condensation. Tape insulation tight to box. Do not insulate or interfere with actuator, access panel and control panel.

3.2 ADJUSTING

A. All boxes shall be set to the cfm shown on the drawings. TCC shall be responsible to field recalibrate all boxes that are not set correctly.

END OF SECTION 23 36 00

SECTION 23 37 00 - AIR INLETS AND OUTLETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Grilles And Registers.

B. Maximum Security Grilles and Registers

C. Architectural Square Panel Diffusers.

D. Linear Diffusers.

E. Linear Diffuser Supply Plenum.

F. Louvers.

G. Roof Curbs.

H. Goosenecks.

1.2 QUALITY ASSURANCE

A. Test and rate performance of air inlets and outlets per ASHRAE 70.

B. Test and rate performance of louvers per AMCA 500L-99.

C. All air handling and distribution equipment mounted outdoors shall be designed to prevent rain intrusion into the airstream when tested at design airflow and with no airflow, using the rain test apparatus described in Section 58 of UL 1995.

1.3 SUBMITTALS

A. Submit product data under provisions of Section 23 05 00.

B. Submit schedule of inlets and outlets indicating type, size, location, application, and noise level.

C. Review requirements of inlets and outlets as to size, finish, and type of mounting prior to submitting product data and schedules of inlets and outlets.

D. Submit manufacturer's installation instructions.

E. Submit electrical power/controls wiring diagrams and product data indicating general assembly, components, safety controls, and service connections.

1.4 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90A.

B. Conform to ASHRAE 90.1.

1.5 EXTRA STOCK

A. Provide clean filters in all filter return grilles at time of installation.

B. Provide one additional set of replacement filters for all filter return grilles. Deliver to Owner at job site.

PART 2 - PRODUCTS

2.1 AIR TERMINALS - GRILLES AND REGISTERS

A. Reference to a grille means an air supply, exhaust or transfer device without a damper.

B. Reference to a register means an air supply, exhaust or transfer device with a damper.

C. The type of unit, margin, material, finish, etc., shall be as shown on the drawing schedule and suitable for the intended use.

D. All margins shall be compatible with ceiling types specified (including 'Thin-Line' T-bar lay-in grid system). Any discrepancies in contract documents shall be brought to the attention of the Architect/Engineer, in writing, prior to Bid Date. Submission of Bid indicates ceiling and air inlet and outlet types have been coordinated.

E. The capacity and size of the unit shall be as shown on the drawings.

F. All units shall handle the indicated cfm as shown on the drawings while not exceeding an NC level of 25, referenced to 10^{-12} watts with a 10 dB room effect. .

G. Refer to the drawings for construction material, color and finish, margin style, deflection, and sizes of grilles and registers.

H. Provide with 3/4" blade spacing. Blades shall have steel friction pivots to allow for blade adjustment, plastic pivots are not acceptable.

I. Corners of steel grilles and registers shall be welded and ground smooth before painting. Aluminum grilles and registers shall have staked corners.

J. Where specified to serve registers, provide opposed blade volume dampers operable from the face of the register.

K. Where specified to have filters, provide with filter rack suitable for 2" thick MERV-8 pleated media filters. Grille border shall be fabricated from minimum 22 gauge steel or minimum 0.040-inch thick for aluminum grilles. Provide removable grille face with metal knurled knob or quarter turn fastener to allow for filter media replacement.

L. Screw holes for surface fasteners shall be countersunk for a neat appearance. Provide concealed fasteners for installation in lay-in ceilings and as specified on the drawings.

M. Manufacturers:

1. Tuttle & Bailey
2. Titus
3. Price
4. Nailor
5. Carnes
6. Metalaire
7. Krueger
8. Anemostat
9. Raymon Donco

2.2 AIR TERMINALS - ARCHITECTURAL SQUARE PANEL DIFFUSERS

A. Reference to a diffuser means an air supply device, ceiling mounted, that shall diffuse air uniformly throughout the conditioned space.

B. The type of unit, margin, material, finish, etc., shall be as shown on the drawing schedule. Flat-oval inlets are not acceptable for connection to flexible ducts.

C. All margins shall be compatible with ceiling types specified (including 'Thin-Line' T-bar lay-in grid system). Any discrepancies in contract documents should be brought to the attention of the Architect/Engineer, in writing, prior to Bid Date. Submission of Bid indicates ceiling and air inlet and outlet types have been coordinated.

D. The capacity and size of the unit shall be as shown on the drawings.

E. All units shall handle the indicated cfm as shown on the drawings while not exceeding an NC level of 25, referenced to 10^{-12} watts with a 10 dB room effect. .

F. Diffusers shall be architectural solid square panel and flush with ceiling.

G. The exposed surface shall be smooth, flat and free of visible fasteners. The face panel shall be 22 gauge steel with a rolled edge or shall be 18 gauge with a smooth ground, uniform edge.

H. The back pan shall be one piece 22 gauge stamped and shall include an integral inlet. (Welded inlets and corner joints are not acceptable).

I. Diffusers with a 24x24 back pan shall have a minimum 18x18 face panel size. Diffusers with a 12x12 back pan shall have a minimum 9x9 face panel size.

J. The face panel shall be mechanically fastened to the back panel with steel components. (Plastic fasteners are not acceptable.)

K. Manufacturers:

1. Tuttle & Bailey
2. Titus
3. Price
4. Nailor

5. Carnes
6. Metalaire
7. Krueger
8. Anemostat
9. Raymon Donco

2.3 MAXIMUM SECURITY GRILLES AND REGISTERS

A. Suicide-deterrent security grilles designed for maximum security applications. as shown on the plans and outlet schedule. Grilles shall have a 3/16-inch thick steel face and shall comply with the National Institute of Corrections guidelines for suicide prevention. The sleeve shall be 3/16-inch thick and shall be stitch-welded to the face and along the entire length of all sleeve seams.

B. Optional opposed-blade volume damper shall be constructed of heavy gauge steel or aluminum. Damper must be operated from the rear of the grille

C. The finish shall be an anodic acrylic paint, The paint must pass a 100-hour ASTM B117 Corrosive Environments Salt Spray Test without creepage, blistering or deterioration of film. The paint must pass a 250-hour ASTM D870 Water Immersion Test. The paint must also pass the ASTM D2794 Reverse Impact Cracking Test with a 50-inch pound force applied.

D. Manufacturers: Titus SG-SD or pre-approved equal.

2.4 AIR TERMINALS - LINEAR DIFFUSERS

A. Plenum Slot Diffusers (Lay-In):

1. The type of unit, margin size, material, finish, etc., shall be as shown on the Drawing Schedule. Flat-oval inlets are NOT acceptable for connection to flexible ducts. Provide sheet metal oval-to-round transition if required.
2. The capacity and size of the unit shall be as shown on the drawings.
3. All units shall handle the indicated cfm as shown on the drawings while not exceeding an NC level of 25, referenced to 10^{-12} watts with a 10 dB room effect. .
4. Install T-bars on both sides of diffusers for lay-in ceiling system, install manufacturer frame for sheetrock or plaster ceiling system. Diffuser margins system shall be compatible with ceiling types specified, color to match ceiling system. Contractor shall coordinate margin types with ceilings prior to submitting shop drawings.
5. Linear diffusers and mounting frames shall be furnished as one piece up to 5' in length.
6. Diffusers shall be furnished with factory installed adjustable "ice tong" style pattern deflectors capable of providing 180° pattern adjustment.
7. A manual volume damper shall be furnished and installed by the Contractor in branch ductwork to each slot diffuser. Balancing dampers shall not be installed in supply plenum or at air outlet unless otherwise indicated on the drawings.
8. Number and width of slots shall be as shown on the drawings.
9. Provide integral insulated plenum for each linear diffuser. Refer to linear diffuser supply plenum specification section for details.

10. Manufacturers:

    a. Tuttle & Bailey ITPS
    b. Carnes DA
    c. Price TBD
    d. Krueger PTBS
    e. Nailor 5800
    f. Titus TBD
    g. Metalaire
    h. Anemostat API
    i. Raymon Donco SAT

11. Linear diffusers for fire-rated ceiling shall be UL labeled with a non-adjustable air pattern. Airflow direction shall be as shown on the drawings.
12. Manufacturers for fire-rated diffusers:

    a. Kees FRK-UL
    b. Titus TBD-FR
    c. Krueger PFTBS
    d. Price TBD2-FR
    e. Raymon Donco 2000FR
    f. Metalaire

B. Linear Slot Diffusers (Continuous):

1. The type of unit, margin size, material, finish, etc., shall be as shown on the Drawing Schedule. Flat-oval inlets are NOT acceptable for connection to flexible ducts. Provide sheet metal oval-to-round transition if required.
2. The capacity and size of the unit shall be as shown on the drawings.
3. All units shall handle the indicated cfm as shown on the drawings while not exceeding an NC level of 25, referenced to 10^{-12} watts with a 10 dB room effect..
4. Install T-bars on both sides of diffusers for lay-in ceiling system, install manufacturer frame for Sheetrock or plaster ceiling system. Diffuser margins system shall be compatible with ceiling types specified, color to match ceiling system. Contractor shall coordinate margin types with ceilings prior to submitting shop drawings.
5. Provide with concealed fasteners for installation in the field.
6. Linear diffusers and mounting frames shall be furnished as one piece up to 6' in length. Provide auxiliary support per manufacturer's recommendations for slot diffusers greater than 4' in length.
7. Diffusers shall be furnished with adjustable pattern deflectors capable of providing 180° pattern adjustment.
8. A manual volume damper shall be furnished and installed by the Contractor in branch ductwork to each slot diffuser. Balancing dampers shall not be installed in supply plenum or at air outlet unless otherwise indicated on the drawings.
9. Number and width of slots shall be as shown on the drawings.
10. Provide insulated plenum for each linear diffuser. Refer to linear diffuser supply plenum specification section for details.

11. Manufacturers:

    a. Tuttle & Bailey 6000/7000
    b. Carnes CH
    c. Price SDS
    d. Krueger 1900
    e. Nailor 5000
    f. Titus ML
    g. Anemostat SLAD
    h. Raymon Donco HPL
    i. Metalaire

C. Linear Slot Diffusers (High Performance):

1. The type of unit, margin size, material, finish, etc., shall be as shown on the Drawing Schedule. Flat-oval inlets are NOT acceptable for connection to flexible ducts. Provide sheet metal oval-to-round transition if required.
2. The capacity and size of the unit shall be as shown on the drawings.
3. All units shall handle the indicated cfm as shown on the drawings while not exceeding an NC level of 25, referenced to 10^{-12} watts with a 10 dB room effect per ANSI/ASHRAE 70.
4. Install T-bars on both sides of diffusers for lay-in ceiling system, install manufacturer frame for sheetrock or plaster ceiling system. Diffuser margins system shall be compatible with ceiling types specified, color to match ceiling system. Contractor shall coordinate margin types with ceilings prior to submitting shop drawings.
5. Provide with concealed fasteners for installation in the field.
6. Linear slot diffusers and mounting frames shall be furnished as one piece up to 6' in length. Provide auxiliary support per manufacturer's recommendations for slot diffusers greater than 4' in length.
7. Diffusers shall be furnished with adjustable pattern deflectors.
8. A manual volume damper shall be furnished and installed by the Contractor in branch ductwork to each slot diffuser. Balancing dampers shall not be installed in supply plenum or at air outlet unless otherwise indicated on the drawings.
9. Number and width of slots shall be as shown on the drawings.
10. Provide insulated plenum for each linear diffuser. Refer to linear diffuser supply plenum specification section for details.
11. Manufacturers:

    a. Price JS
    b. Titus FL
    c. Krueger DF
    d. Anemostat FF
    e. Raymon Donco WF2000
    f. Metalaire

D. Linear Bar Grille Diffusers:

1. The type of unit, margin size, material, finish, etc., shall be as shown on the Drawing Schedule. Flat-oval inlets are NOT acceptable for connection to flexible ducts. Provide sheet metal oval-to-round transition if required.

2. The capacity and size of the unit shall be as shown on the drawings.
3. All units shall handle the indicated cfm as shown on the drawings while not exceeding an NC level of 25, referenced to 10^{-12} watts with a 10 dB room effect per ANSI/ASHRAE 70.
4. Install T-bars on both sides of diffusers for lay-in ceiling system, install manufacturer frame for sheetrock or plaster ceiling system. Diffuser margins system shall be compatible with ceiling types specified, color to match ceiling system. Contractor shall coordinate margin types with ceilings prior to submitting shop drawings.
5. Provide with concealed fasteners for installation in the field.
6. Linear bar diffusers and mounting frames shall be furnished as one piece up to 6' in length. Provide auxiliary support per manufacturer's recommendations for slot diffusers greater than 4' in length.
7. A manual volume damper shall be furnished and installed by the Contractor in branch ductwork to each bar grille. Balancing dampers shall not be installed in supply plenum or at air outlet unless otherwise indicated on the drawings.
8. Diffuser length and width, bar width, and spacing between bars shall be as shown on the drawings.
9. Provide insulated plenum for each linear diffuser. Refer to linear diffuser supply plenum section for details.
10. Manufacturers:

    a. Tuttle & Bailey 4000
    b. Carnes CC;CT;CW
    c. Krueger 1500/1600
    d. Price LB
    e. Nailor 4900
    f. Titus CT
    g. Metalaire 2000
    h. Anemostat AL/TL
    i. Raymon Donco DGB

2.5 AIR TERMINALS - LINEAR DIFFUSER SUPPLY PLENUM

A. Linear diffusers shall be provided with field fabricated or prefabricated supply plenums. Plenum shall be a minimum of 2-1/2" wider than total slot width, minimum length of slot, and minimum height of 10". Plenums with end fed duct connections shall not exceed 8' in length. The cross sectional area of the plenum shall be designed for a maximum velocity of 500 fpm and the aspect ratio shall be limited to a width-to-height ratio of less than 1.5. Plenums with side outlets shall be designed for a maximum velocity of 600 fpm and inlet ducts to plenum shall be spaced 5' on center maximum. Inlet ducts to plenums shall have a maximum velocity of 900 fpm. Flat-oval inlets are NOT acceptable for connection to flexible ducts. Provide sheet metal oval-to-round transition if required.

B. Plenum shall be constructed with 24 gauge galvanized steel and shall have side inlets unless shown otherwise on the drawings. Refer to Ductwork Application Schedule in Section 23 31 00 for insulation requirements.

C. End caps and required accessories shall be integral with the plenum or furnished and installed by the Mechanical Contractor.

D. A manual volume damper shall be furnished and installed by the Mechanical Contractor in branch ductwork to each slot diffuser. Balancing dampers shall not be installed in supply plenum or at air outlet unless otherwise indicated on the drawings

E. Prefabricated plenums shall be by the same manufacturer as the linear diffuser or Kees Inc.

2.6 LOUVERS - FIXED - ALUMINUM

A. Louvers shall be minimum 4" deep and constructed of extruded aluminum. Blade, jamb and sill thickness shall be minimum 0.081". Blades shall be spaced at a maximum of 5.1" apart.

B. Louvers shall be of the drainable blade design with water collected on the leading edge of the blade and diverted to the jamb.

C. Louvers shall be furnished with aluminum bird screen mounted on the inside surface.

D. Size, cfm, finish and pressure drop for louvers shall be as scheduled on the drawings.

E. AMCA Certified performance for 48" x 48" samples with intake airflow of 8,000 cfm shall not exhibit more than 0.19" pressure drop. Maximum water penetration shall be 0.01 ounces per square foot at the scheduled intake velocity based on 15 minute test duration when subjected to a water flow rate of 0.25 gal/min as described under the Water Penetration Test in AMCA 500-L-07.

F. Contractor shall provide the General Contractor with the correct sizes and locations of all louvers required in masonry walls.

G. Louvers shall be sealed around perimeter to avoid moisture penetration between the louver frame and wall.

H. Louvers shall be suitable for duct connection.

I. Manufacturers:

1. Air Flow - "EA-403"
2. Arrow - "EA-415-D"
3. American Warming & Ventilating - "LE-21"
4. Construction Specialties - "A4097"
5. Dowco - "DBE-4"
6. Louvers & Dampers, Inc. - "IL-23"
7. Ruskin - "ELF375DX"
8. Vent Products - "2760"
9. Greenheck - ESD "403"
10. Pottorff - EFD
11. United Enertech FL-D-4

2.7 ROOF CURBS

A. Furnish and install, where shown on the drawings, prefabricated roof curbs for all rooftop hood openings.

B. Roof Mounting Curb: Curb shall be sized to match curb cap of the hood. Curb height as shown on drawings, minimum 14 gauge galvanized steel, one-piece construction, insulated, all welded, wood nailer.

C. Curbs shall be unitized construction, 18 gauge galvanized steel, with continuous arc welded corner seams, insulated with 1-1/2" thick, 3 lb. density rigid fiberglass board and damper support angle.

D. Curb without cant - suitable for use with membrane type roof.

E. Manufacturers:

1. Same manufacturer as the equipment it serves or Pate, RPS, or Thy.

2.8 GOOSENECKS

A. Fabricate in accordance with SMACNA Duct Construction Standards of minimum 18 gauge galvanized steel.

B. Mount on minimum 12 inch high curb base.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Installation Requirements:

1. Install items in accordance with manufacturers' instructions.
2. Install seismic restraints according to SMACNA's "Kitchen Equipment Fabrication Guidelines, Appendix 1, Guidelines for Seismic Restraints for Kitchen Equipment".
3. Check location of inlets and outlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.
4. Install diffusers to ductwork with air tight connections.
5. Flexible ducts shall NOT be joined to flat-oval connections. Provide sheet metal oval-to-round transitions where required.
6. Supply air diffusers in operating rooms (Class B and C surgery) shall be opened and cleaned before the space is used.
7. Supply grille and register blades shall be aimed in the field to provide adequate air distribution in the space. All return grilles and registers blades shall be oriented to minimize sight distance beyond installed device.

B. Volume Damper:

1. Provide manual volume dampers on duct take-off to diffusers when there are multiple connections to a common duct. Locate volume dampers as far as possible from the air inlet or outlet.

C. Maintaining Duct Cleanliness:

1. When grilles, registers, and diffusers are installed, Contractor shall prevent construction dust, dirt, and debris from entering ductwork as required by Section 23 05 00.

END OF SECTION 23 37 00

SECTION 23 74 16.12 - PACKAGED ROOFTOP AIR CONDITIONING UNITS 25 TON AND BELOW

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Packaged Rooftop Unit.

B. Unit Controls.

C. Roof Mounting Frame and Base.

D. Economizers.

E. Power Exhaust.

1.2 QUALITY ASSURANCE

A. All insulation inside the unit and in the air stream must comply with the requirement of NFPA 90A (maximum flame spread of 25 and maximum smoke developed of 50).

B. All units must be UL or ETL listed and must contain UL labeled components.

C. Fans shall be tested and rated in cabinet in accordance with AMCA Standard 210. All fan assemblies shall be dynamically balanced in cabinet at final assembly.

D. Conform to ASHRAE 90.1.

E. All air handling and distribution equipment mounted outdoors shall be designed to prevent rain intrusion into the airstream when tested at design airflow and with no airflow, using the rain test apparatus described in Section 58 of UL 1995.

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 23 05 00.

B. Indicate electrical service and duct connections on shop drawings or product data.

C. Submit manufacturer's installation instructions.

D. Submit electrical power/controls wiring diagrams and product data indicating general assembly, components, safety controls, and service connections.

E. Provide 8 octave maximum sound power levels at unit discharge and return connection.

F. Submit certification that the packaged rooftop air conditioning units, accessories, and components will withstand seismic forces defined in Section 23 05 50. Include the following:

1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect units from physical damage by storing off site until roof mounting frames are in place, ready for immediate installation of units.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include manufacturer's descriptive literature, installation instructions, maintenance and repair data, and parts listing.

1.6 WARRANTY

A. Provide five (5) year manufacturer's warranty for compressors.

B. Provide five (5) year manufacturer's warranty for heat exchanger.

C. Provide standard year manufacturer's warranty for controls and electrical components (thermostats, VFD, etc.).

1.7 MAINTENANCE SERVICE

A. Contractor shall furnish complete service and maintenance of packaged roof top units for one year from Date of Substantial Completion.

B. Provide maintenance service with a two-month interval as maximum time period between calls. Provide 24-hour emergency service on breakdowns and malfunctions.

C. Include maintenance items as outlined in manufacturer's operating and maintenance data, including minimum of four (quarterly) filter replacements, minimum of one fan belt replacement, and controls checkout, seasonal adjustments, and recalibrations.

D. Submit copy of service call work order or report and include description of work performed to Owner and Architect/Engineer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: The scheduled manufacturer is the Basis of Design. The Contractor is responsible for all costs, schedule impacts, and construction coordination, including design costs and regulatory agency approvals, related to using a specified alternate product other than the Basis of Design. Refer to Section 23 05 00 for additional information.

B. Trane

C. York

D. Daikin

E. Valent

F. Aaon

2.2 MANUFACTURED UNITS

A. Provide roof-mounted units having gas burner, and electric refrigeration.

B. Unit shall be self-contained, packaged, factory assembled, pre-wired and tested, consisting of cabinet and frame, supply fan, controls, air filters, refrigerant cooling coil and compressor.

C. Unit shall be furnished with non-fused disconnect switch, short fuse protection of all internal electrical components, and all necessary motor starters, contactors, and over-current protection.

2.3 FABRICATION

A. Cabinet: Galvanized steel with baked enamel finish, access doors or removable access panels with quick fasteners locking door handle type with piano hinges. Access doors shall be provided at each section (e.g., filter section, supply fan section, etc.). All exterior access panels must be permanently labeled on the outside indicating what is behind the panel. Structural members shall be minimum 18 gauge, with access doors or removable panels of minimum 20 gauge.

B. Outside Air Intakes: The outside air intakes shall be located a minimum of 15 inches above the roof mounting curb to minimize the effect of heat pickup from the roof during the natural cooling cycle and the effects of snow on the roof during winter operation. Each air intake shall be furnished with rain eliminators.

C. Insulation: All sections shall be double wall, foam injected casings.

D. Heat Exchangers: Stainless steel, of welded construction.

E. Air Filters: Two inch thick glass fiber disposable media in metal frames.

2.4 ROOF MOUNTING FRAME AND BASE

A. Roof Mounting Curb: Minimum 12 inches high, minimum 14 gauge galvanized steel, one-piece construction, insulated, all welded, wood nailer.

2.5 FANS/MOTORS

A. Fans:

1. Supply Fans: centrifugal; SWSI plenum or vane axial fan.
2. Exhaust Fans: Propeller or SWSI plenum fan.
3. All fans shall be aluminum or composite construction with fan shaft: turned, ground and polished steel; keyed to wheel hub.
4. Fan and motor assemblies shall be resiliently mounted.
5. Direct drive motor or with V-belt drive and rubber isolated hinge mounted motor.
6. All fan bearings must be capable of being lubricated by easily accessible grease fittings.
7. All fans must be statically and dynamically balanced.

B. Motors:

1. Motors shall be "variable frequency drive rated" when controlled by VFDs. Refer to Section 23 05 13.
2. No equipment shall be selected or operate above 90% of its motor nameplate rating.
3. Motor shall have 1.15 service factor.

C. Belt Drive Fans:

1. Belt drive fans must be within ± 10% of scheduled RPM.
2. Belt drive fans shall have slide rails, adjusting screws, anchor bolts, and bedplates.
3. Drives shall be V-belt type with adjustable pitch sheaves for units 20 HP and below. On units over 20 HP, use fixed sheaves. This Contractor shall provide replacement sheaves and belts as required to allow final air balancing.
4. Units used with variable speed drives shall have fixed sheaves. This Contractor shall provide replacement sheaves and belts as required to allow final air balancing.

2.6 BURNER

A. Gas Burner: Forced draft type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shutoff, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shutoff pilot. fully modulating gas valve with minimum 4:1 turndown.

B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after airflow proven and slight delay, allow gas valve to open.

C. High Limit Control: Temperature sensor with fixed stop at maximum permissible setting, de-energize burner on excessive bonnet temperature and energize burner when temperature drops to lower safe value.

D. Supply Fan Control: Temperature sensor sensing bonnet temperatures and independent of burner controls, or adjustable time delay relays with switch for continuous fan operation.

2.7 EVAPORATOR COIL

A. Provide copper tube with aluminum fin coil assembly.

B. Install a drain pan under each cooling coil meeting requirements as outlined in ASHRAE 62.1. The drain pans shall extend the entire width of each coil, including piping and header if in the air stream. The length shall be as necessary to limit water droplet carryover beyond the drain pan to 0.0044oz per ft2 of face area per hour under peak sensible and peak dew point design conditions, considering both latent load and coil face velocity. Pitch drain pans in two directions towards the outlet, with a slope of at least 1/8" per foot.

C. Provide capillary tubes or thermostatic expansion valves for units of 6 tons capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons cooling capacity and larger.

D. Provide insulation on liquid refrigerant and suction piping between compressor and evaporator coil where not protected by drain pans. Insulation shall be elastomeric cellular foam; ANSI/ASTM C534; flexible plastic; 0.27 maximum 'K' value at 75°F, 25/50 flame spread/smoke developed rating when tested in accordance with ASTM E84 (UL 723). Maximum 1" thick per layer where multiple layers are specified.

E. Drain Pan Condensate Overflow Switch: Float with integral magnet overflow switch conforming to UL508. Factory installed in drain pan and wired to shut the rooftop unit down with a fault alarm. No standby power required.

2.8 HOT GAS REHEAT COIL

A. Provide copper tube with aluminum fin coil assembly.

B. Valves to reroute hot refrigerant gas from the discharge line of the compressor through the reheat coil.

2.9 COMPRESSOR

A. Provide hermetic or semi-hermetic compressors (quantity as scheduled on drawings), 3600 rev/min maximum, resiliently mounted with positive lubrication, crankcase heater for operation down to 0°F, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.

B. Five minute timed off circuit shall delay compressor start.

C. Provide capacity control by providing inverter duty compressors.

D. The use of hydrochlorofluorocarbon (HCFC) or chlorofluorocarbon (CFC) based refrigerants is prohibited.

2.10 CONDENSER

A. Condenser shall provide design capacity between the minimum and maximum ambient conditions scheduled on the drawings.

B. Condenser Coil:

1. Round Copper Tube and Aluminum Fins: Construct condenser coils of aluminum fins mechanically bonded to seamless copper tubing. Air test under water to 450 psig.
2. Microchannel: All aluminum brazed fin construction. The maximum allowable working pressure of the condenser is 450 psig. Air test under water to 450 psig.

C. Condenser Fans: Provide direct drive low noise blade design propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Fan blade shall be aluminum or composite material.

D. Condenser Motors: Fan motors shall be an ECM type motor for proportional control. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase.

E. Entire fan assembly shall be statically and dynamically balanced.

F. Provide refrigerant pressure switches to cycle condenser fans.

G. Provide hail guards on all condenser coils.

H. Liquid and discharge isolation valves with staged and digital scrolls.

2.11 MIXING SECTION

A. Dampers: Provide remote controlled outside and return air dampers with damper operator and remote rheostat for adjusting outside air quantity.

B. Dampers: Provide outside, return, and relief dampers with damper operator and control package to automatically vary outside air quantity. Outside air damper shall fail to closed position.

C. Gaskets: Provide tight fitting dampers with edge gaskets. Gaskets must be mechanically fastened (use of adhesive alone shall not be acceptable). Damper blades shall be gasketed with side seals to provide an air leakage rate of Class 1A at 1" w.c. pressure differential for a 24"x 24" damper.

D. Damper Actuator: 24 volt with gear train sealed in oil, with spring return on units 7.5 tons cooling capacity and larger.

2.12 ECONOMIZERS

A. Factory installed by approved rooftop unit manufacturer with fully modulating motorized outside air and return air dampers.

B. To be controlled by differential enthalpy with fixed dry-bulb controller with minimum position setting.

C. Shall be equipped with 100% capable relief barometric damper relieving up to 100% return air and sealed to meet ASHRAE 90.1 requirements.

D. Shall be capable of introducing up to 100% outside air.

E. Shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.

F. Dampers shall be capable of completely closing when unit is in unoccupied mode.

G. Outside air damper normally closed and return air damper normally open.

H. Provide factory installed and tested, outdoor air monitor that controls outdoor air ± 15% accuracy down to 40 cfm per ton.

I. Provide a field installed duct/space-mounted C02 sensor. Outside air damper position shall modulate between the demand control ventilation limit (minimum position setpoint) and the ventilation limit (maximum non-economizer position setpoint) to satisfy the space requirements. Damper position shall be controlled to the greater of the two command signals, either minimum outside airflow or space IAQ (CO2).

J. Economizer Fault Detection and Diagnostics (FDD):

1. Air-cooled unitary direct-expansion units that are equipped with an economizer shall include a fault detection and diagnostics system complying with the following:

a. The following temperature sensors shall be permanently installed to monitor system operation:

1) Outside air.
2) Supply air.
3) Return air.

b. Temperature sensors shall have an accuracy of ±2°F over the range of 40°F to 80°F.
c. Refrigerant pressure sensors, where used, shall have an accuracy of ± 3 percent of full scale.
d. The unit controller shall be configured to provide system status by indicating the following:

1) Free cooling available.
2) Economizer enabled.

3) Compressor enabled.
4) Heating enabled.
5) Mixed air low limit cycle active.
6) The current value of each sensor.

e. The unit controller shall be capable of manually initiating each operating mode so that the operation of compressors, economizers, fans, and the heating system can be independently tested and verified.
f. The fault detection and diagnostics system shall be configured to detect the following faults:

1) Air temperature sensor failure/fault.
2) Not economizing when the unit should be economizing.
3) Economizing when the unit should not be economizing.
4) Damper not modulating.
5) Excess outdoor air.

g. The unit shall be configured to report faults to a fault management application available for access by day-to-day operating or service personnel or annunciated locally on zone thermostats.

2.13 POWER EXHAUST

A. Factory installed by economizer supplier or compatible equivalent.

B. Controlled by economizer controls.

C. Power exhaust shall be factory wired to electrical section complete with conduit, feeders, disconnect, and overcurrent protection. Power exhaust shall be energized based on building pressure or when dampers open past the adjustable setpoint of the economizer control.

D. Must comply with Energy Code Fan Power Limitation formula.

E. Fans:

1. Exhaust Fans: Propeller
2. All fans shall be aluminum or composite construction with fan shaft: turned, ground and polished steel; keyed to wheel hub.
3. Fan and motor assemblies shall be resiliently mounted
4. Direct drive motor.
5. All fan bearings must be capable of being lubricated by easily accessible grease fittings.
6. All fans must be statically and dynamically balanced.

F. Motors:

1. Motors shall be open drip-proof with grease lubricated bearings.
2. Motors shall be "variable frequency drive rated" when controlled by VFDs. Refer to Section 23 05 13.

3. No equipment shall be selected or operate above 90% of its motor nameplate rating.

2.14 ELECTRICAL

A. Provide with single point power connection to service all controls, dampers, outlet, and fans, complete with non-fused disconnect switch, short circuit protection of all internal electrical components, and all necessary motor starters, contactors, and over-current protection, transformer, and convenience outlet.

B. All units must be so constructed that when the electrical section access panel is opened, all electrical power to the unit (with the exception of the 120 volt duplex convenience outlet) is disconnected by means of a single disconnect**.**

C. All wiring must be labeled, numbered, and terminate in "spade clips". All terminal strips must be keyed to the wiring numbers. Each control device must be permanently labeled to indicate its function.

D. Wiring diagrams for all circuits must be permanently affixed to the inside of the electrical section access panel. The markings of terminal strips and wiring must agree with the numbering on the wiring diagrams.

E. All units shall include a transformer for controls and convenience outlet.

F. Only one power cable connection to the unit shall be necessary.

G. Motor shall include phase failure protection and prevent the motor from operation in the event of phase loss.

2.15 OPERATING CONTROLS - SINGLE ZONE UNITS

A. When ECM are applied:

1. Single Zone VAV: The unit controller shall proportionally control the ECM motors on the supply fan based on space temperature. The unit controller shall increase/decrease the speed of the supply fan in order to maintain the space temperature within its setpoint and deadband. The unit controller shall provide discharge air temperature control with the compressor modulation.

B. When variable speed drives are applied:

1. Single Zone VAV: An electronic variable frequency drive shall be provided for the supply air fan. Each drive shall be factory installed out of the airstream in a conditioned cabinet. Drives shall meet UL Standard 95-5V. The completed unit assembly shall be listed by a recognized safety agency, such as ETL. Drives are to be accessible through a hinged door assembly. Mounting arrangements that expose drives to high temperature unfiltered ambient air are not acceptable.

C. Room thermostat shall incorporate:

1. Automatic switching from heating to cooling.

2. Preferential rate control to minimize overshoot and deviation from set point.
3. Set-up for four separate temperatures per day.
4. Instant override of setpoint for continuous or timed period from one hour to 31 days.
5. Short cycle protection.
6. Programming based on weekdays, Saturday and Sunday.
7. Switch selection features including imperial or metric display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.

D. Room thermostat display shall include:

1. Time of day.
2. Actual room temperature.
3. Programmed temperature.
4. Programmed time.
5. Duration of timed override.
6. Day of week.
7. System model indication: heating, cooling, auto, off, fan auto, fan on.
8. Stage (heating or cooling) operation.

E. Provide low limit sequence to close outside air dampers and stop supply fan.

F. Mixed Air Controls: Maintain selected supply air temperature and revert dampers to minimum outside air position on a call for heating and above 75°F ambient, when ambient air enthalpy exceeds return air enthalpy.

G. Dehumidification Controls: Maintain the relative humidity setpoint with the hot refrigerant gas reheat coil.

2.16 OPERATING CONTROLS - VARIABLE VOLUME UNITS

A. Temperature transmitter located in supply air shall signal electronic logic panel to control mixing dampers and cooling in sequence to maintain 55°F(adj.).

B. Control cooling by modulating compressors.

C. Control logic shall allow adjustable supply air reset under low load or airflow conditions.

D. Dehumidification Controls: Maintain the relative humidity setpoint with the hot refrigerant gas reheat coil.

E. Seven-day timeclock with spring carry over (or electronic clock with battery backup) shall control unit on occupied/unoccupied schedule. At night, unit shall be off. Locate clock in remote control panel with status lights.

F. Provide two stage morning warm-up thermostat to hold outdoor dampers closed and energize heat until return air temperature reaches set point.

G. Program Options: Each central control panel is individually configurable as an air conditioner controller for a variable volume system.

H. Supply Air Temperature Sensor Input: The supply air temperature sensor monitors the air handling unit discharge air temperature. It is used by the central control panel to control the stages of heating and cooling, and to protect the air handling unit from excessively high or low discharge air temperatures. The leaving air temperature sensor requires twisted, shielded pair wire. Terminations are screw terminals.

I. System Control: The central control panel scans the unit control modules to determine the deviations from temperature setpoint, time of deviation, time from last changeover, and number of UCMs requiring heating or cooling. Based upon this information, the system heat/cool mode and stage of capacity is selected. The central control panel also monitors the system air temperature to ensure that high and low temperature limits are maintained.

J. Operators Panel: An operator's panel may be used to control up to two central control panels. The 16-button keypad and 2 line/40-character display shall give the operator individual zone status and control from one location.

1. Zone control functions include:

a. Occupied heat/cool setpoints.
b. Unoccupied heat/cool setpoints.

2. Zone status includes:

a. Current zone temperature.
b. Current occupancy mode.
c. Current heat/cool mode.

3. Time-of-day scheduling shall be available by group, individually for each of the four groups. Scheduling shall be two on/off periods per day for each of the seven weekdays. A holiday schedule shall also be available for each group. Up to 24 holiday dates can also be scheduled. Groups timed override can be enabled from the keypad for a two-hour period. Operator's panel shall have a 365 day clock with daylight savings time and leap year functions.

2.17 DDC TEMPERATURE CONTROLS

A. Install standalone control module providing communication between unit controls and packaged DDC temperature control system.

B. Control module shall be compatible with temperature control system specified in Section 23 09 00. Provide BACnet gateway for communication.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings and illustrated by the manufacturer.

B. Verify that proper power supply is available.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount units on factory built roof mounting curb and provide watertight enclosure to protect ductwork and utility services. Install unit level.

C. All field wiring shall be in accordance with the National Electrical Code.

D. P-traps must be provided for all drain pans.

E. Comb all coils to repair bent fins.

F. Contractor shall coordinate unit access stair and walkway placement to ensure compliance with OSHA requirements.

3.3 MANUFACTURER'S FIELD SERVICES

A. Provide initial start-up and shutdown during first year of operation.

END OF SECTION 23 74 16.12

SECTION 23 81 26 - SPLIT SYSTEM AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Split system air conditioning wall units.

1.2 SUBMITTALS

A. Submit shop drawings under provisions of Section 23 05 00.

B. Indicate drain, electrical, and refrigeration rough-in connections on shop drawings or product data.

C. Submit manufacturer's installation instructions.

D. Submit certification that split system air conditioning equipment, accessories, and components will withstand seismic forces defined in Section 23 05 50. Include the following:

1. Basis for Certification: Indicate whether certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Accept units and components on site in factory protective containers, with factory shipping skids and lifting lugs. Inspect for damage.

B. Comply with manufacturer's installation instruction for rigging, unloading, and transporting units.

C. Protect units from weather and construction traffic by storing in dry, roofed location until units are ready for immediate installation.

1.4 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90A for the installation of computer room air conditioning units.

B. Conform to ASHRAE 90.1 (latest published edition) - Energy Standard for Buildings Except Low-Rise Residential Buildings.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include manufacturer's descriptive literature, operating instructions, installation instructions, and maintenance and repair data.

1.6 WARRANTY

A. Provide five (5) year manufacturer's warranty on all compressors.

PART 2 - PRODUCTS

2.1 SPLIT SYSTEM WALL AND CEILING-MOUNTED UNITS

A. Manufacturers:
1. LG
2. Panasonic/Sanyo
3. Samsung
4. Daikin Applied
5. Trane/Mitsubishi
6. York/Hitachi
7. Lennox

B. Manufactured Units:

1. Provide packaged, air-cooled, factory assembled, pre-wired and pre-piped unit consisting of cabinet, fans, filters, remote condensing unit, and controls. Wall-mounted units shall be furnished with integral wall mounting bracket and mounting hardware.
2. Assemble unit for wall-mounted or ceiling installation with service access required.
3. Performance shall be as scheduled on the drawings.
4. Unit shall be rated per AHRI Standards 210/240 and listed in the AHRI directory as a matched system.
5. Provide unit with factory-supplied cleanable air filters.
6. The units shall be listed by Electrical Laboratories (ETL) in accordance with UL-1995 certification and bear the ETL label.
7. All wiring shall be in accordance with the National Electric Code (NEC).

C. Evaporator Cabinet and Frame:

1. Cabinet:

a. Refer to schedule on drawings for mounting type (wall-mounted).
b. Exposed units shall have a finished appearance with concealed refrigerant piping, condensate drain piping, and wiring connections.

2. Air Distribution Panel (for ceiling-mounted units): Heavy molded plastic 4-way discharge plenum with return air grille and unit filter. Designed for installation into T-bar ceiling system, 24" x 24" size.

D. Evaporator Fans and Motors:

1. Fans:

a. The evaporator fan shall be direct drive with a single motor having permanently lubricated bearings.
b. The fan shall be statically and dynamically balanced.
c. The indoor fan shall have at least three speeds.

2. Motor:

a. Direct driven, digitally controlled with multiple speeds. Permanently lubricated with internal overload protection.

E. Evaporator Coils (Direct Expansion):

1. Direct expansion cooling coil of seamless copper tubes expanded into aluminum fins.
2. Single refrigeration circuit with externally equalized expansion valve.
3. Coils shall be pressure tested at the factory.
4. A sloped, corrosion-resistant condensate pan with drain shall be provided under the coil.

F. Electrical Panel:

1. Service Connections, Wiring, and Disconnect Requirements: Conform to the National Electrical Code and local electrical codes.

G. Control:

1. The unit shall have a hard-wired 7-day programmable remote controller to operate the system. Provide wall mounting bracket for controller.
2. Remote controller shall have "automatic", "dry" (dehumidification), and "fan only" operating modes.
3. The remote controller shall have the following features:

a. On/Off power switch.
b. Mode Selector to operate the system in auto, cool, heat, fan, or dehumidification (dry) operation.

c. Fan Setting to provide multiple fan speeds.
d. Swing Louver for adjusting supply louver discharge.
e. On/Off Timer for automatically switching the unit off or on.
f. Temperature Adjustment allows for the increase or decrease of the desired temperature.
g. Powerful Operation to allow quick cool down or heating up in the desired space to achieve maximum desired temperature in the shortest allowable time.

4. The remote controller shall perform fault diagnostic functions that may be system related, indoor or outdoor unit related depending on the fault code.
5. Temperature range on the remote controller shall be 64°F to 90°F in cooling mode and 50°F to 86°F in heating mode.
6. The indoor unit microprocessor shall have the capability to receive and process commands via return air temperature and indoor coil temperature sensors enabled by commands from the remote controller.
7. Integration: Manufacturer shall provide a BACnet interface with the building automation system in accordance with ASHRAE/ANSI Standard 135. This may be accomplished through a system integration panel or "gateway". Integration panels shall be provided as part of the split system.

H. Outdoor Unit:

1. General:

a. The outdoor unit shall be specifically matched to the corresponding indoor unit size. The outdoor unit shall be completely factory assembled and pre-wired with all necessary electronic and refrigerant controls.

2. Cabinet:

a. The outdoor unit shall be fabricated of galvanized steel, bonderized and coated with a baked enamel finish for corrosion protection.

3. Fan:

a. The fan shall be direct drive, propeller type fan with fan guard.
b. Fan blades shall be statically and dynamically balanced.
c. The fan shall have permanently lubricated type bearings.
d. Motor shall be protected by internal thermal overload protection.
e. Airflow shall be horizontal discharge.

4. Coil:

a. The outdoor coil shall be nonferrous construction with corrugated fin tube.
b. The coil shall be protected with an internal guard.
c. Refrigerant flow from the condenser shall be controlled via a metering device.

5. Compressor:

    a. Hermetic or scroll refrigerant compressors with resilient suspension system, inverter driven, oil strainer, sight glass/moisture indicator, internal motor protection, high pressure switch, and crankcase heater.
    b. The outdoor unit shall have an accumulator and four-way reversing valve.

6. Refrigerant:

    a. Unit shall use R-410a.
    b. The use of chlorofluorocarbon (CFC)-based refrigerants is prohibited.

I. Integral Condensate Pump:

1. Packaged unit matched to evaporator unit including float switch, pump, motor assembly, check valve, and reservoir.
2. Provide alarm to indicate high level reservoir.
3. Unit shall be powered from evaporator unit with appropriate field connections available.

J. Condensate Pump:

2.2 PIPING

A. Design Pressure: 450 psig; Maximum Design Temperature: 250°F

B. Type ACR Seamless Copper Tube Linesets; Brazed Joints:

1. 3/4" and under.
2. Tubing: Type ACR seamless copper tube linesets, ASTM B1003. Sizes indicated are nominal designation.
3. Joints: Brazed with silver solder.
4. Fittings: Wrought copper solder joint, ANSI B16.22.
5. Special Requirements: All tubing shall be cleaned, dehydrated, pressurized with dry nitrogen, plugged, and tagged by manufacturer "for refrigeration service". During brazing operations, continuously purge the interior of the pipe with nitrogen to prevent oxide formation.
6. Limitations:
    a. Only between refrigerant splitter box and indoor terminal unit.
    b. For use above ceiling only. Do not use in exposed areas.

C. Refrigerant linesets are permitted.

1. Provide manufacturer-packaged refrigerant linesets and accessories of sizes needed for installation. Verify lengths of piping required for installation.

2.3 INSULATION

A. EPDM (NBR/PVC Blend is not permitted) elastomeric cellular foam; ANSI/ASTM C534; flexible plastic; 0.25 maximum 'K' value at 75°F, 25/50 flame spread/smoke developed rating when tested in accordance with ASTM E84 (UL 723). Minimum 1/2" thick for pipe sizes less than 1-1/4" and 3/4" thick for pipe sizes 1-1/4" and above.

2.4 EXPANSION COMPENSATION

A. Assembly consisting of two flexible connectors, two copper flexible connectors, two 90° elbows, and a 180° return pipe. Unit shall be in the form of a pipe loop.

B. Connectors shall have corrugated copper hose bodies with copper braided casings.

C. Connectors shall be rated for 150 psi working pressure at 70°F.

D. Sizes 2" and smaller shall have copper sweat ends.

E. Connectors shall be suitable for 1/2" permanent misalignment.

F. Manufacturer:

1. Metraflex Type MLS

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that proper power supply is available.

3.2 INSTALLATION

A. General Installation Requirements:

1. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
2. Install units in accordance with manufacturer's instructions. Install all units level and plumb. Indoor units shall be installed using manufacturer's standard mounting hardware securely fastened to building structure.
3. Refer to Section 23 05 29 for roof support rails for outdoor unit.
4. Coordinate the exact mounting location of all indoor and outdoor units with architectural and electrical work. Coordinate installation of ceiling-mounted units with ceiling grid layout. Provide additional ceiling grid reinforcement or modification as required and coordinate the work with the GC. Locate the indoor unit where it is readily accessible for maintenance and filter changes. Where outdoor units are located on the roof, locate at least 10' from the roof edge.
5. Verify locations of wall-mounted remote controllers with drawings and room details before installation. Coordinate mounting heights to be consistent with other wall-mounted devices. Height above finished floor shall not exceed 48".

B. Condensate Removal:

1. Install condensate piping with trap and route from drain pan to nearest drain. Discharge to nearest code-approved receptor or to a properly vented indirect waste fitting. Flush all piping before making final connections to units.

C. Comb all coils to repair bent fins.

D. Install new filters in the unit at Substantial Completion.

E. A factory-authorized service agent shall assist in commissioning the unit and inspecting the installation prior to startup. Submit startup report with O&M manuals.

3.3 REFRIGERANT PIPING

A. Install refrigerant piping from the indoor unit(s) to the condensing unit. Refrigerant pipe sizes, lengths, specialties and configurations shall be as recommended by the manufacturer. Evacuate refrigerant piping and fully charge system with refrigerant per manufacturer's requirements.

B. Provide weather-tight insulated roof curb to accommodate refrigerant piping and conduit roof penetrations.

C. Insulate all refrigerant piping. Both liquid and suction lines shall be insulated between the indoor and outdoor units.

D. Joining of Piping:

1. Brazed Joints:

a. Make up joints with brazing filler metal conforming to ANSI/AWS A5.8. Cut copper tubing ends perfectly square and remove all burrs inside and outside. Thoroughly clean sockets of fittings and ends of tubing to remove all oxide, dirt, and grease just prior to brazing. Apply flux evenly, but sparingly, to all surfaces to be joined. Brazing filler metal with a flux coating may also be used. Heat joints uniformly to proper brazing temperature so braze filler metal flows to all mated surfaces. Wipe excess braze filler metal, leaving a uniform fillet around cup of fitting.
b. Flux shall conform to ANSI/AWS A5.31.
c. Remove composition discs and all seals during brazing if not suitable for a minimum of 840°For greater than the melting temperature of the brazing filler metal, whichever is greater.

E. Insulation:

1. Insulate all refrigerant pipes between the heat pump and indoor units. This includes the liquid pipe, the suction pipe, the hot gas pipe, and the high/low pressure gas pipe. All fittings, valves, and specialty refrigerant components in the piping between the indoor and heat pump units shall also be insulated. The insulation shall have a continuous vapor barrier and shall pass through hangers and supports unbroken. All exterior insulated piping shall be painted with minimum of one (1) coat of UV resistant paint. Over size hangers and supports to allow the insulation to pass through unbroken. Following are the minimum insulation thicknesses unless noted otherwise in the manufacturer's literature or required by local AHJ:

    a. Code/Year: ASHRAE 2016,IECC 2018

    b. Refrigerant Suction (40°F & Below):

        1) Up to 1": 1/2"
        2) 1" and up: 1"

    c. Refrigerant Suction (41°F to 60°F):

        1) Up to 1-1/2": 1/2"
        2) 1-1/2" and up: 1"

    d. Refrigerant Low Pressure Gas (141°F to 200°F):

        1) Up to 1-1/2": 1-1/2"
        2) 1-1/2" and up: 2"

    e. Refrigerant High Pressure Gas (201°F to 250°F):

        1) Up to 4": 2-1/2"

    f. Refrigerant Liquid:

        1) Up to 1-1/2": 1"
        2) 1-1/2" and up: 1-1/2"

END OF SECTION 23 81 26

SECTION 26 05 00 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements applicable to all Division 26 Sections. Also refer to Division 1 - General Requirements. This section is also applicable to Interior Communications Pathways Section 27 05 28. This section is also applicable to Fire Alarm and Detection Systems Section 28 31 00.

B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

1.2 REFERENCES

A. NFPA 70 - National Electrical Code (NEC)

1.3 SCOPE OF WORK

A. This Specification and the associated drawings govern furnishing, installing, testing and placing into satisfactory operation the Electrical Systems.

B. The Contractor shall furnish and install all new materials as indicated on the drawings, and/or in these specifications, and all items required to make the portion of the Electrical Work a finished and working system.

C. All work will be awarded under a single General Contract. The division of work listed below is for the Contractor's convenience and lists normal breakdown of the work.

D. Description of Systems shall be as follows:

1. Electrical power system to and including luminaires, equipment, motors, devices, etc.
2. Electrical power service system from the Utility Company to and including service entrance equipment, distribution and metering.
3. Grounding system.
4. Fire alarm system.
5. Removal work and/or relocation and reuse of existing systems and equipment.
6. Technology Systems as described in Division 27/28 and on the T-series documents as described in the Suggested Matrix of Scope Responsibility.
7. Furnish and install firestopping systems for penetrations of fire-rated construction associated with this Contractor's work.

E. Work Not Included:

1. Telecommunications cabling will be by Division 27, in raceways and conduits furnished and installed as part of the Electrical work.
2. Temperature control wiring for plumbing and HVAC equipment (unless otherwise indicated) will be by other Contractors.

1.4 WORK SEQUENCE

A. All work that will produce excessive noise or interference with normal building operations in the Town Hall, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during unoccupied hours. The Owner reserves the right to determine when restricted construction hours are required.

1.5 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL, and CONTROL CONTRACTORS

A. Division of work is the responsibility of the Prime Contractor. Any scope of work described at any location on the contract document shall be sufficient for including said requirement in the project. The Prime Contractor shall be solely responsible for determining the appropriate subcontractor for the described scope. In no case shall the project be assessed an additional cost for scope that is described on the contract documents on bid day. The following division of responsibility is a guideline based on typical industry practice.

B. Definitions:

1. "Mechanical Contractors" refers to the Contractors listed in Division 21/22/23 of this Specification.
2. "Technology Contractors" refers to the Contractors furnishing and installing systems listed in Division 27/28 of this Specification.
3. Motor Power Wiring: The single phase or 3 phase wiring extending from the power source (transformer, panelboard, feeder circuits, etc.) through disconnect switches and motor controllers to, and including the connections to the terminals of the motor.
4. Motor Control Wiring: The wiring associated with the remote operation of the magnetic coils of magnetic motor starters or relays, or the wiring that permits direct cycling of motors by means of devices in series with the motor power wiring. In the latter case, the devices are usually single phase, have "Manual-Off-Auto" provisions, and are usually connected into the motor power wiring through a manual motor starter.
5. Control devices such as start-stop push buttons, thermostats, pressure switches, flow switches, relays, etc., generally represent the types of equipment associated with motor control wiring.
6. Motor control wiring is single phase and usually 120 volts. In some instances, the voltage will be the same as the motor power wiring. When the motor power wiring exceeds 120 volts, a control transformer is usually used to give a control voltage of 120 volts.
7. Temperature Control Wiring: The wiring associated with the operation of a motorized damper, solenoid valve or motorized valve, etc., either modulating or two-position, as opposed to wiring that directly powers or controls a motor used to drive equipment such as fans, pumps, etc. This wiring will be from a 120-volt source and may continue as 120 volt, or be reduced in voltage (24 volt), in which case a control transformer shall be furnished as part of the temperature control wiring.
8. Control Motor: An electric device used to operate dampers, valves, etc. It may be two-position or modulating. Conventional characteristics of such a motor are 24 volts, 60 cycles, 1 phase, although other voltages may be encountered.

9. Low Voltage Technology Wiring: The wiring associated with the technology systems, used for analog or digital signals between equipment.
10. Telecommunications/Technology Rough-in: Relates specifically to the backboxes, necessary plaster rings and other miscellaneous hardware required for the installation or mounting of telecommunications/technology information outlets.

C. General:

1. The purpose of these Specifications is to outline the Electrical and Mechanical Contractors' responsibilities related to electrical work required for items such as temperature controls, mechanical equipment, fans, chillers, compressors, etc. The exact wiring requirements for much of the equipment cannot be determined until the systems have been selected and submittals approved. Therefore, the electrical drawings show only known wiring related to such items. All wiring not shown on the electrical drawings, but required for mechanical systems, is the responsibility of the Mechanical Contractor.
2. Where the drawings require the Electrical Contractor to wire between equipment furnished by the Mechanical Contractor, such wiring shall terminate at terminals provided in the equipment. The Mechanical Contractor shall furnish complete wiring diagrams and supervision to the Electrical Contractor and designate the terminal numbers for correct wiring.
3. The Electrical Contractor shall establish electrical utility elevations prior to fabrication and installation. The Electrical Contractor shall coordinate utility elevations with other trades. When a conflict arises, priority shall be as follows:

    a. Luminaires.
    b. Gravity flow piping, including steam and condensate.
    c. Electrical bus duct.
    d. Sheet metal.
    e. Cable trays, including access space.
    f. Other piping.
    g. Conduits and wireway.

D. Mechanical Contractor's Responsibility:

1. Assumes responsibility for internal wiring of all equipment furnished by the Mechanical Contractor.
2. Assumes all responsibility for miscellaneous items furnished by the Mechanical Contractor that require wiring but are not shown on the electrical drawings or specified in the Electrical Specification. If items such as relays, flow switches, or interlocks are required to make the mechanical system function correctly or are required by the manufacturer, they are the responsibility of the Mechanical Contractor.
3. Assumes all responsibility for Temperature Control wiring, if the Temperature Control Contractor is a Subcontractor to the Mechanical Contractor.
4. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

E. Temperature Control Contractor's or Subcontractor's Responsibility:

1. Wiring of all devices needed to make the Temperature Control System functional.
2. Verifying any control wiring on the electrical drawings as being by the Electrical Contractor. All wiring required for the Control System, but not shown on the electrical drawings, is the responsibility of the Temperature Control Contractor or Subcontractor.
3. Coordinating equipment locations (such as PE's, EP's, relays, transformers, etc.) with the Electrical Contractor, where wiring of the equipment is by the Electrical Contractor.

F. Electrical Contractor's Responsibility:

1. Furnishes and installs all combination starters, manual starters and disconnect devices shown on the Electrical Drawings or indicated to be by the Electrical Contractor in the Mechanical Drawings or Specifications.
2. Installs and wires all remote-control devices furnished by the Mechanical Contractor or Temperature Control Contractor when so noted on the Electrical Drawings.
3. Furnishes and installs motor control and temperature control wiring, when noted on the drawings.
4. Furnishes, installs, and connects all relays, etc., for automatic shutdown of certain mechanical equipment (supply fans, exhaust fans, etc.) upon actuation of the Fire Alarm System.
5. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

G. General (Electrical/Technology):

1. "Electrical Contractor" as referred to herein shall be responsible for scope listed in Division 27/28 of this specification when the "Suggested Matrix of Scope Responsibility" indicated work shall be furnished and installed by the EC. Refer to the Contract Documents for this "Suggested Matrix of Scope Responsibility".
2. The purpose of these Specifications is to outline the Electrical and Technology Contractor's work responsibilities as related to Telecommunications Rough-in, conduit, cable tray, power wiring and Low Voltage Technology Wiring.
3. The exact wiring requirements for much of the equipment cannot be determined until the systems have been purchased and submittals approved. Therefore, only known wiring, conduits, raceways and electrical power related to such items is shown on the Technology drawings. Other wiring, conduits, raceways, junction boxes and electrical power not shown on the Technology Drawings but required for operation of the systems is the responsibility of the Technology Contractor and included in said Contractor's bid.
4. Where the Electrical Contractor is required to install conduit, conduit sleeves and/or power connections in support of Technology systems, the final installation shall not be until a coordination meeting between the Electrical Contractor and the Technology Contractor has convened to determine the exact location and requirements of the installation.

5. Where the Electrical Contractor is required to install cable tray that will contain Low Voltage Technology Wiring, installation shall not begin prior to a coordination review of the cable tray shop drawings by the Technology Contractor.

H. Technology Contractor's Responsibility:

1. Assumes all responsibility for the low voltage technology wiring of all systems, including cable support where open cable is specified.
2. Assumes all responsibility for all required backboxes, conduit and power connections not specifically shown as being furnished and installed by the Electrical Contractor on the "Suggested Matrix of Scope Responsibility".
3. Assumes all responsibility for providing and installing all ladder rack and other cable management hardware (as defined herein).
4. Responsible for providing the Electrical Contractor with the required grounding lugs or other hardware for each piece of technology equipment which is required to be bonded to the telecommunications ground bar.
5. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

1.6 COORDINATION DRAWINGS

A. Definitions:

1. Coordination Drawings: A compilation of the pertinent layout and system drawings that show the sizes and locations, including elevations, of system components and required access areas to ensure that no two objects will occupy the same space.

a. Mechanical trades shall include, but are not limited to, mechanical equipment, ductwork, fire protection systems, plumbing piping, medical gas systems, hydronic piping, steam and steam condensate piping, and any item that may impact coordination with other disciplines.
b. Electrical trades shall include, but are not limited to, electrical equipment, conduit 1.5" and larger, conduit racks, cable trays, pull boxes, transformers, raceway, busway, lighting, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
c. Technology trades shall include, but are not limited to, technology equipment, racks, conduit 1.5" and larger, conduit racks, cable trays, ladder rack, pull boxes, raceway, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
d. Maintenance clearances and code-required dedicated space shall be included.
e. The coordination drawings shall include all underground, underfloor, in-floor, in chase, and vertical trade items.

2. Spaces with open/cloud ceiling architecture shall indicate the overhead utilities and locate equipment as required to maintain clearance above lights. The intent for the installation is to maintain a maximum allowable vertical clearance and an organized/clean manner in the horizontal. Notify Architect/Engineer of the maximum clearance which can be maintained. Failure to comply will result in modifications with no cost to Owner.

    a. In cloud ceiling architecture, when open cabling/wire and/or cable tray crosses gaps between ceiling clouds and/or walls, cabling is to transition to conduits to span the gaps in order to conceal cabling from below.

3. The contractors shall use the coordination process to identify the proper sequence of installation of all utilities above ceilings and in other congested areas, to ensure an orderly and coordinated end result, and to provide adequate access for service and maintenance.

B. Participation:

1. The contractors and subcontractors responsible for work defined above shall participate in the coordination drawing process.
2. One contractor shall be designated as the Coordinating Contractor for purposes of preparing a complete set of composite electronic CAD coordination drawings that include all applicable trades, and for coordinating the activities related to this process. The Coordinating Contractor for this project shall be the Mechanical Contractor.

    a. The Coordinating Contractor shall utilize personnel familiar with requirements of this project and skilled as draftspersons/CAD operators, competent to prepare the required coordination drawings.

3. Electronic CAD drawings shall be submitted to the Coordinating Contractor for addition of work by other trades. IMEG will provide electronic file copies of ventilation drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by IMEG. IMEG will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings.

C. Drawing Requirements:

1. The file format and file naming convention shall be coordinated with and agreed to by all contractors participating in the coordination process and the Owner.

    a. Scale of drawings:

        1) General plans: 1/4 Inch = 1 '-0" (minimum).
        2) Mechanical, electrical, communication rooms, and including the surrounding areas within 10 feet: 1/2 Inch = 1'-0" (minimum).
        3) Shafts and risers: 1/2 Inch = 1'-0" (minimum).
        4) Sections of shafts and mechanical and electrical equipment rooms: 1/4 Inch = 1 '-0" (minimum).
        5) Sections of congested areas: 1/2 Inch = 1'-0" (minimum).

2. Ductwork layout drawings shall be the baseline system for other components. Ductwork layout drawings shall be modified to accommodate other components as the coordination process progresses.
3. There may be more drawings required for risers, top and bottom levels of mechanical rooms, and shafts.
4. The minimum quantity of drawings will be established at the first coordination meeting and sent to the A/E for review. Additional drawings may be required if other areas of congestion are discovered during the coordination process.

D. General:

1. Coordination drawing files shall be made available to the A/E and Owner's Representative. The A/E will only review identified conflicts and give an opinion, but will not perform as a coordinator.
2. A plotted set of coordination drawings shall be available at the project site.
3. Coordination drawings are not shop drawings and shall not be submitted as such.
4. The contract drawings are schematic in nature and do not show every fitting and appurtenance for each utility. Each contractor is expected to have included in the bid sufficient fittings, material, and labor to allow for adjustments in routing of utilities made necessary by the coordination process and to provide a complete and functional system.
5. The contractors will not be allowed additional costs or time extensions due to participation in the coordination process.
6. The contractors will not be allowed additional costs or time extensions for additional fittings, reroutings or changes of duct size, that are essentially equivalent sizes to those shown on the drawings and determined necessary through the coordination process.
7. The A/E reserves the right to determine space priority of equipment in the event of spatial conflicts or interference between equipment, piping, conduit, ducts, and equipment provided by the trades.
8. Changes to the contract documents that are necessary for systems installation and coordination shall be brought to the attention of the A/E.
9. Access panels shall preferably occur only in gypsum board walls or plaster ceilings where indicated on the drawings.

    a. Access to mechanical, electrical, technology, and other items located above the ceiling shall be through accessible lay-in ceiling tile areas.
    b. Potential layout changes shall be made to avoid additional access panels.
    c. Additional access panels shall not be allowed without written approval from the A/E at the coordination drawing stage.
    d. Providing additional access panels shall be considered after other alternatives are reviewed and discarded by the A/E and the Owner's Representative.
    e. When additional access panels are required, they shall be provided without additional cost to the Owner.

10. Complete the coordination drawing process and obtain sign-off of the drawings by all contractors prior to installing any of the components.

11. Conflicts that result after the coordination drawings are signed off shall be the responsibility of the contractor or subcontractor who did not properly identify their work requirements or installed their work without proper coordination.
12. Updated coordination drawings that reflect as-built conditions may be used as record documents.

1.7 QUALITY ASSURANCE

A. Contractor's Responsibility Prior to Submitting Pricing/Bid Data:

1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guides, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Architect/Engineer any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Architect/Engineer will be done at the Contractor's risk.

B. Qualifications:

1. Only products of reputable manufacturers as determined by the Architect/Engineer are acceptable.
2. All Contractors and subcontractors shall employ only workmen who are skilled in their trades. At all times, the number of apprentices at the job site shall be less than or equal to the number of journeymen at the job site.

C. Compliance with Codes, Laws, Ordinances:

1. Conform to all requirements of the City of Caseyville, Illinois. Codes, Laws, Ordinances and other regulations having jurisdiction.
2. If there is a discrepancy between the codes and regulations and these specifications, the Architect/Engineer shall determine the method or equipment used.
3. If the Contractor notes, at the time of bidding, that any parts of the drawings or specifications do not comply with the codes or regulations, Contractor shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, Contractor shall submit with the proposal a separate price to make the system comply with the codes and regulations.
4. All changes to the system made after the letting of the contract to comply with codes or the requirements of the Inspector, shall be made by the Contractor without cost to the Owner.
5. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.

D. Permits, Fees, Taxes, Inspections:

1. Procure all applicable permits and licenses.
2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
3. Pay all charges for permits or licenses.
4. Pay all fees and taxes imposed by State, Municipal, and other regulatory bodies.
5. Pay all charges arising out of required inspections by an authorized body.
6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
7. Where applicable, all fixtures, equipment and materials shall be listed by Underwriter's Laboratories, Inc. or a nationally recognized testing organization.
8. Pay all telephone company charges related to the service or change in service.

E. Utility Company Requirements:

1. Secure from the private or public utility company all applicable requirements.
2. Comply with all utility company requirements.
3. The Owner shall make application for and pay for new electrical service equipment and installation. The Contractor shall coordinate schedule and requirements with the Owner and Utility Company.
4. The contractor is responsible for completing utility requested forms and sharing utility requested load data from the construction documents.
5. Furnish the meter socket metering. Verify approved manufacturers and equipment with the Utility Company.

F. Examination of Drawings:

1. The drawings for the electrical work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of raceways to best fit the layout of the job. Conduit entry points for electrical equipment including, but not limited to, panelboards, switchboards, switchgear and unit substations, shall be determined by the Contractor unless noted in the contract documents.
3. Scaling of the drawings will not be sufficient or accurate for determining these locations.
4. Where job conditions require reasonable changes in arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
5. Because of the scale of the drawings, certain basic items, such as junction boxes, pull boxes, conduit fittings, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
6. If an item is either shown on the drawings or called for in the specifications, it shall be included in this contract.

7. The Contractor shall determine quantities and quality of material and equipment required from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater and better-quality number shall govern.
8. Where used in electrical documents the word "furnish" shall mean supply for use, the word "install" shall mean connect up complete and ready for operation, and the word "provide" shall mean to supply for use and connect up complete and ready for operation.

G. Electronic Media/Files:

1. Construction drawings for this project have been prepared utilizing Revit.
2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by IMEG.
4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.
5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
6. The drawings prepared by IMEG for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.
7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.
8. The information is provided to expedite the project and assist the Contractor with no guarantee by IMEG as to the accuracy or correctness of the information provided. IMEG accepts no responsibility or liability for the Contractor's use of these documents.

H. Field Measurements:

1. Verify all pertinent dimensions at the job site before ordering any conduit, conductors, wireways, bus duct, fittings, etc.

1.8 SUBMITTALS

A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

1. Submittals list:

Referenced Specification Section	Submittal Item	Coordination Drawing
26 05 13	Wire and Cable	
26 05 26	Grounding and Bonding	
26 05 33	Conduit and Boxes	+> 1.5"

Referenced Specification Section	Submittal Item	Coordination Drawing
26 05 48	Seismic Requirements for Equipment and Supports	
26 05 73	Power System Study	
26 20 00	Service Entrance	
26 24 16	Panelboards	Yes
26 27 26	Wiring Devices	Ceiling mount
26 27 29	Electric Vehicle Charging Station	
26 28 16	Disconnect Switches	Yes
26 32 13	Packaged Engine Generator Systems	Yes
26 36 00	Transfer Switch	Yes
26 43 00	Surge Protection Devices	
26 51 19	LED Lighting	Yes
28 31 00	Fire Alarm and Detection Systems	Yes
Drawings	Photocells, Timeclocks, Relays	

B. General Submittal Procedures: In addition to the provisions of Division 1, the following are required:

1. Transmittal: Each transmittal shall include the following:

    a. Date
    b. Project title and number
    c. Contractor's name and address
    d. Division of work (e.g., electrical, plumbing, heating, ventilating, etc.)
    e. Description of items submitted and relevant specification number
    f. Notations of deviations from the contract documents
    g. Other pertinent data

2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:

    a. Date
    b. Project title and number
    c. Architect/Engineer
    d. Contractor and subcontractors' names and addresses
    e. Supplier and manufacturer's names and addresses
    f. Division of work (e.g., electrical, plumbing, heating, ventilating, etc.)
    g. Description of item submitted (using project nomenclature) and relevant specification number
    h. Notations of deviations from the contract documents
    i. Other pertinent data
    j. Provide space for Contractor's review stamps

3. Composition:

    a. Submittals shall be submitted using specification sections and the project nomenclature for each item.
    b. Individual submittal packages shall be prepared for items in each specification section. All items within a single specification section shall be packaged together where possible. An individual submittal may contain items from multiple specifications sections if the items are intimately linked (e.g., pumps and motors).
    c. All sets shall contain an index of the items enclosed with a general topic description on the cover.

4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; wiring and control diagrams; dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
5. Contractor's Approval Stamp:

    a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
    b. Unstamped submittals will be rejected.
    c. The Contractor's review shall include, but not be limited to, verification of the following:

        1) Only approved manufacturers are used.
        2) Addenda items have been incorporated.
        3) Catalog numbers and options match those specified.
        4) Performance data matches that specified.
        5) Electrical characteristics and loads match those specified.
        6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
        7) Dimensions and service clearances are suitable for the intended location.
        8) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
        9) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).

    d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.
    e. The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.

6. Submittal Identification and Markings:

    a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
    b. The Contractor shall clearly indicate the size, finish, material, etc.
    c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
    d. All marks and identifications on the submittals shall be unambiguous.

7. Schedule submittals to expedite the project. Coordinate submission of related items.
8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.
9. Reproduction of contract documents alone is not acceptable for submittals.
10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Architect/Engineer.
11. Submittals not required by the contract documents may be returned without review.
12. The Architect/Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Architect/Engineer to recheck and handle the additional shop drawing submittals.
13. Submittals shall be reviewed and approved by the Architect/Engineer before releasing any equipment for manufacture or shipment.
14. Contractor's responsibility for errors, omissions or deviation from the contract documents in submittals is not relieved by the Architect/Engineer's approval.
15. Schedule shall allow for adequate time to perform orderly and proper review of submittals, including time for consultants and Owner if required, and resubmittals by Contractor if necessary, and to cause no delay in Work or in activities of Owner or other contractors.

    a. Allow at least two weeks for Architect's/Engineer's review and processing of each submittal, excluding mailing.

16. Architect/Engineer reserves the right to withhold action on a submittal which, in the Architect/Engineer's opinion, requires coordination with other submittals until related submittals are received. The Architect/Engineer will notify the Contractor, in writing, when they exercise this right.

C. Electronic Submittal Procedures:

1. Distribution: Email submittals as attachments to all parties designated by the Architect/Engineer, unless a web-based submittal program is used.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.

4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. Submittal file name: 26 XX XX.description.YYYYMMDD
    b. Transmittal file name: 26 XX XX.description.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.

1.9 SCHEDULE OF VALUES

A. The requirements herein are in addition to the provisions of Division 1.

B. Format:

1. Use AIA Document Continuation Sheets G703 or another similar form approved by the Owner and Architect/Engineer.
2. Submit in Excel format.
3. Support values given with substantiating data.

C. Preparation:

1. Itemize work required by each specification section and list all providers. All work provided by subcontractors and major suppliers shall be listed on the Schedule of Values. List each subcontractor and supplier by company name.
2. Break down all costs into:

    a. Material: Delivered cost of product with taxes paid.
    b. Labor: Labor cost, excluding overhead and profit.

3. Itemize the cost for each of the following:

    a. Overhead and profit.
    b. Bonds.
    c. Insurance.
    d. General Requirements: Itemize all requirements.

4. For each line item having an installed cost of more than $5,000, break down costs to list major products or operations under each item. At a minimum, provide material and labor cost line items for the following:

    a. Each piece of equipment requiring shop drawings. Use the equipment nomenclature (SB-1, PANEL P-1, etc.) on the Schedule of Values.
    b. Each type of small unitary equipment (e.g., FDS, FCS, CS, etc.). Multiple units of the same type can be listed together provided quantities are also listed so unit costs can be determined.

c. Each conduit system (medium voltage, normal, emergency, low voltage systems, etc.). In addition, for larger projects breakdown the material and labor for each conduit system based on geography (building, floor, and/or wing).
d. Fire alarm broken down into material and labor for the following:

1) Engineering
2) Controllers, devices, sensors, etc.
3) Conduit
4) Wiring
5) Programming
6) Commissioning

e. Site utilities (5' beyond building)
f. Seismic design
g. Testing
h. Commissioning
i. Record drawings
j. Punchlist and closeout

D. Update Schedule of Values when:

1. Indicated by Architect/Engineer.
2. Change of subcontractor or supplier occurs.
3. Change of product or equipment occurs.

1.10 CHANGE ORDERS

A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders shall be broken down by sheet or associated individual line item indicated in the change associated narrative, whichever provides the most detailed breakdown. Change orders with inadequate breakdown will be rejected.

B. Itemized pricing with unit cost shall be provided from all distributors and associated subcontractors.

C. Change order work shall not proceed until authorized.

1.11 PRODUCT DELIVERY, STORAGE, HANDLING and MAINTENANCE

A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage.

B. Keep all materials clean, dry and free from damaging environments.

C. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Electrical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.

D. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate the work with other trades.

1.12 NETWORK / INTERNET CONNECTED EQUIPMENT

A. These specifications may require certain equipment or systems to have network, Internet and/or remote access capability ("Network Capability"). Any requirement for Network Capability shall be interpreted only as a functional capability and is not to be construed as authority to connect or enable any Network Capability. Network Capability may only be connected or enabled with the express written consent of the Owner.

B. The following network connected equipment shall be equipped with restricted access protocols:

1. Adjustable trip overcurrent protection devices
2. Power monitoring and control
3. Electrical controls
4. Lighting control system
5. Variable frequency drives
6. Package engine generator and remote annunciator
7. Transfer switch and remote annunciator
8. Fire alarm and automatic detection

1.13 WARRANTY

A. Provide a mimimum one-year warranty for all fixtures, equipment, materials, and workmanship.

B. The warranty period for all work in this specification Division shall commence on the date of Substantial Completion or successful system performance whichever occurs later. The warranty may also commence if a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization of the Owner. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.

C. Warranty requirements extend to correction, without cost to the Owner, of all work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage due to defects or nonconformance with contract documents excluding repairs required as a result of improper maintenance or operation, or of normal wear as determined by the Architect/Engineer.

1.14 INSURANCE

A. This Contractor shall maintain insurance coverage as set forth in Division 1 of these specifications.

1.15 MATERIAL SUBSTITUTION

A. Where several manufacturers' names are given, the manufacturer for which a catalog number is given is the basis for job design and establishes the quality.

B. Equivalent equipment manufactured by the other listed manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications and fits in the allocated space. When using other listed manufacturers, the Contractor shall assume responsibility for any and all modifications necessary (including, but not limited to structural supports, electrical connections and rough-in, and regulatory agency approval, etc.) and coordinate such with other contractors. The Architect/Engineer shall make the final determination of whether a product is equivalent.

C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer via addendum. The Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on the Contractors part or on the part of other Contractors whose work is affected.

D. Voluntary add or deduct prices for alternate materials may be listed on the bid form. These items will not be used in determining the low bidder. This Contractor assumes all costs incurred as a result of using the offered material or equipment on the Contractors part or on the part of other Contractors whose work is affected.

E. All material substitutions requested after the final addendum must be listed as voluntary changes on the bid form.

PART 2 - PRODUCTS

2.1 GENERAL

A. All items of material having a similar function (e.g., safety switches, panelboards, switchboards, contactors, motor starters, dry type transformers) shall be of the same manufacturer unless specifically stated otherwise on drawings or elsewhere in specifications.

PART 3 - EXECUTION

3.1 JOBSITE SAFETY

A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or the employees and subconsultants at a construction site, shall relieve the Contractor and any other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.2 EXCAVATION, FILL, BACKFILL, COMPACTION

A. General:

1. Prior to the commencement of any excavation or digging, the Contractor shall verify all underground utilities with the regional utility locator. Provide prior notice to the locator before excavations. Contact information for most regional utility locaters can be found by calling 811.
2. The Contractor shall do all excavating, filling, backfilling, compacting, and restoration in connection with the work.

B. Excavation:

1. Make all excavations to accurate, solid, undisturbed earth, and to proper dimensions.
2. If excavations are carried in error below indicated levels, concrete of same strength as specified for the foundations or thoroughly compacted sand-gravel fill, as determined by the Architect/Engineer shall be placed in such excess excavations under the foundation. Place thoroughly compacted, clean, stable fill in excess excavations under slabs on grade, at the Contractor's expense.
3. Trim bottom and sides of excavations to grades required for foundations.
4. Protect excavations against frost and freezing.
5. Take care in excavating not to damage surrounding structures, equipment or buried pipe. Do not undermine footing or foundation.
6. Perform all trenching in a manner to prevent cave-ins and risk to workmen.
7. Where original surface is pavement or concrete, the surface shall be saw cut to provide clean edges and assist in the surface restoration.
8. If satisfactory bearing soil is not found at the indicated levels, immediately notify the Architect/Engineer or their representative, and do no further work until the Architect/Engineer or their representative gives further instructions.

9. Excavation shall be performed in all ground conditions, including rock, if encountered. Bidders shall visit the premises and determine the soil conditions by actual observations, borings, or other means. The cost of all such inspections, borings, etc., shall be borne by the bidder.
10. If a trench is excavated in rock, a compacted bed with a depth of 3" (minimum) of sand and gravel shall be used to support the conduit unless masonry cradles or encasements are used.
11. Mechanical excavation of the trench to line and grade of the conduit or to the bottom level of masonry cradles or encasements is permitted, unless otherwise indicated on the electrical drawings.
12. Mechanical excavation of the trench to line and grade where direct burial cables are to be installed is permitted provided the excavation is made to a depth to permit installation of the cable on a fine sand bed at least 3 inches deep.

C. Dewatering:

1. Furnish, install, operate and remove all dewatering pumps and pipes needed to keep trenches and pits free of water.

D. Underground Obstructions:

1. Known underground piping, conduit, feeders, foundations, and other obstructions in the vicinity of construction are shown on the drawings. Review all Bid Documents for all trades on the project to determine obstructions indicated. Take great care in making installations near underground obstructions.
2. If objects not shown on the drawings are encountered, remove, relocate, or perform extra work as directed by the Architect/Engineer.

E. Fill and Backfilling:

1. No rubbish or waste material is permitted for fill or backfill.
2. Provide all necessary sand and/or CA6 for backfilling.
3. Native soil materials may be used as backfill if approved by the Geotechnical Engineer.
4. Dispose of the excess excavated earth as directed.
5. Backfill materials (native soil material, sand, and/or CA6) shall be suitable for required compaction, clean and free of perishable materials, frozen earth, debris, earth with a high void content, and stones greater than 4 inches in diameter. Water is not permitted to rise in unbackfilled trenches.
6. Backfill all trenches and excavations immediately after installing of conduit, or removing forms, unless other protection is directed.
7. Around piers and isolated foundations and structures, backfill and fill shall be placed and consolidated simultaneously on all sides to prevent wedge action and displacement. Spread fill and backfill materials in 6" uniform horizontal layers with each layer compacted separately to required density.
8. For conduits that are not concrete encased, lay all conduits on a compacted bed of sand at least 3" deep. Backfill around conduits with sand, in 6" layers and compact each layer.
9. Backfill with native soil material (if approved) or sand up to grade for all conduits under slabs or paved areas. All other conduits shall have sand backfill to 6" above the top of the conduit.

10. Place all backfill above the sand in uniform layers not exceeding 6" deep. Place then carefully and uniformly tamp each layer to eliminate lateral or vertical displacement.
11. Where the fill and backfill will ultimately be under a building, floor or paving, each layer of fill shall be compacted to 95% of the maximum density as determined by AASHTO Designation T-99 or ASTM Designation D-698. Moisture content of soil at time of compaction shall not exceed plus or minus 2% of optimum moisture content as determined by AASHTO T-99 or ASTM D-698 test.
12. After backfilling of trenches, no superficial loads shall be placed on the exposed surface of the backfill until a period of 48 hours has elapsed.

F. Surface Restoration:

1. Where trenches are cut through graded, planted or landscaped areas, the areas shall be restored to the original condition. Replace all planting and landscaping features removed or damaged to its original condition. At least 6" of topsoil shall be applied where disturbed areas are to be seeded or sodded. All lawn areas shall be sodded unless seeding is called out in the drawings or specifications.
2. Concrete or asphalt type pavement, seal coat, rock, gravel or earth surfaces removed or damaged shall be replaced with comparable materials and restored to original condition. Broken edges shall be saw cut and repaired as directed by Architect/Engineer.

3.3 ARCHITECT/ENGINEER OBSERVATION OF WORK

A. The contractor shall provide seven (7) calendar days' notice to the Architect/Engineer prior to:

1. Placing fill over underground and underslab utilities.
2. Covering exterior walls, interior partitions and chases.
3. Installing hard or suspended ceilings and soffits.

B. The Architect/Engineer will review the installation and provide a written report noting deficiencies requiring correction. The contractor's schedule shall account for these reviews and show them as line items in the approved schedule.

C. Above-Ceiling Final Observation:

1. All work above the ceilings must be complete prior to the Architect/Engineer's review. This includes, but is not limited to:

a. All junction boxes are closed and identified in accordance with Section 26 05 53 Electrical Identification.
b. Luminaires, including ceiling-mounted exit and emergency lights, are installed and operational.
c. Luminaire whips are supported above the ceiling.
d. Conduit identification is installed in accordance with Section 26 05 53 Electrical Identification.
e. Luminaires are suspended independently of the ceiling system when required by these contract documents.
f. All wall penetrations have been sealed.

2. To prevent the Above-Ceiling Final Observation from occurring too early, the Contractor shall review the status of the work and certify, in writing, that the work is ready for the Above-Ceiling Final Observation.
3. It is understood that if the Architect/Engineer finds the ceilings have been installed prior to this review and prior to seven days elapsing, the Architect/Engineer may not recommend further payments to the contractor until full access has been provided.

3.4 PROJECT CLOSEOUT

A. The following paragraphs supplement the requirements of Division 1.

B. Final Jobsite Observation:

1. To prevent the Final Jobsite Observation from occurring too early, the Contractor shall review the completion status of the project and certify that the job is ready for the final jobsite observation.
2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review. The Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.
3. It is understood that if the Architect/Engineer finds the job not ready for the final observation and additional trips and observations are required to bring the project to completion, the cost of the additional time and expenses incurred by the Architect/Engineer will be deducted from the Contractor's final payment.
4. Contractor shall notify Architect/Engineer 48 hours prior to installation of ceilings or lay-in ceiling tiles.

C. The following must be submitted before Architect/Engineer recommends final payment:

1. Operation and maintenance manuals with copies of approved shop drawings.
2. Record documents including marked-up or reproducible drawings and specifications.
3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of this Contractor and shall be signed by the Owner's representatives.
4. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site and place in location as directed and submit receipt to Architect/Engineer.
5. Inspection and testing report by the fire alarm system manufacturer.
6. Start-up reports on all equipment requiring a factory installation or start-up.

3.5 OPERATION AND MAINTENANCE MANUALS

A. General:

1. Provide an electronic copy of the O&M manuals as described below for Architect/Engineer's review and approval. The electronic copy shall be corrected as required to address the Architect/Engineer's comments. Once corrected, electronic copies and paper copies shall be distributed as directed by the Architect/Engineer.
2. Approved O&M manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.

B. Electronic Submittal Procedures:

1. Distribution: Email the O&M manual as attachments to all parties designated by the Architect/Engineer.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. O&M file name: O&M.div26.contractor.YYYYMMDD
    b. Transmittal file name: O&Mtransmittal.div26.contractor.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.
6. Provide the Owner with an approved copy of the O&M manual on compact discs (CD), digital video discs (DVD), or flash drives with a permanently affixed label, printed with the title "Operation and Maintenance Instructions", title of the project and subject matter of disc/flash drive when multiple disc/flash drives are required.
7. All text shall be searchable.
8. Bookmarks shall be used, dividing information first by specification section, then systems, major equipment and finally individual items. All bookmark titles shall include the nomenclature used in the construction documents and shall be an active link to the first page of the section being referenced.

C. Operation and Maintenance Instructions shall include:

1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all subcontractors, and major equipment suppliers, with addresses, telephone numbers, website addresses, email addresses and point of contacts. Website URLs and email addresses shall be active links in the electronic submittal.
2. Table of Contents: Include a table of contents describing specification section, systems, major equipment, and individual items.

3. Copies of all final approved shop drawings and submittals. Include Architect's/Engineer's shop drawing review comments. Insert the individual shop drawing directly after the Operation and Maintenance information for the item(s) in the review form.
4. Copies of all factory inspections and/or equipment startup reports.
5. Copies of warranties.
6. Schematic wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
7. Dimensional drawings of equipment.
8. Detailed parts lists with lists of suppliers.
9. Operating procedures for each system.
10. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
11. Repair procedures for major components.
12. Replacement parts and service material requirements for each system and the frequency of service required.
13. Instruction books, cards, and manuals furnished with the equipment.
14. Include record drawings of the one-line diagrams for each major system. The graphic for each piece of equipment shown on the one-line diagram shall be an active link to its associated Operation & Maintenance data.
15. Copies of all panel schedules in electronic Microsoft Excel spreadsheet (.xlsx) file. Each panelboard shall be a separate tab in the workbook.

3.6 INSTRUCTING THE OWNER'S REPRESENTATIVE

A. Adequately instruct the Owner's designated representatives in the maintenance, care, and operation of the complete systems installed under this contract.

B. Provide verbal and written instructions to the Owner's representatives by FACTORY PERSONNEL in the care, maintenance, and operation of the equipment and systems.

C. The Owner has the option to make a video recording of all instructions. Coordinate schedule of instructions to facilitate this recording.

D. The instructions shall include:

1. Maintenance of equipment.
2. Start-up procedures for all major equipment.
3. Description of emergency system operation.
4. .

E. Notify the Architect/Engineer of the time and place for the verbal instructions to be given to the Owner's representative so a representative can be present if desired.

F. Minimum hours of instruction time for each item and/or system shall be as indicated in each individual specification section.

G. Operating Instructions:

1. Contractor is responsible for all instructions to the Owner's representatives for the electrical and specialized systems.

2. If the Contractor does not have staff that can adequately provide the required instructions, the Contractor shall include in the bid an adequate amount to reimburse the Owner for the Architect/Engineer to perform these services.

3.7 RECORD DOCUMENTS

A. The following paragraphs supplement Division 1 requirements.

B. Maintain at the job site a separate and complete set of electrical drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.

C. Mark drawings and specifications to indicate approved substitutions; Change Orders, and actual equipment and materials used. All Change Orders, RFI responses, Clarifications and other supplemental instructions shall be marked on the documents. Record documents that merely reference the existence of the above items are not acceptable. Should this Contractor fail to complete Record Documents as required by this contract, this Contractor shall reimburse Architect/Engineer for all costs to develop record documents that comply with this requirement. Reimbursement shall be made at the Architect/Engineer's hourly rates in effect at the time of work.

D. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.

E. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

F. Record actual routing of conduits exceeding 2 inches.

3.8 PAINTING

A. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available. All equipment shall have a finished coat of paint applied unless specifically allowed to be provided with a prime coat only.

B. Equipment in finished areas that will be painted to match the room decor will be painted by others. Should this Contractor install equipment in a finished area after the area has been painted, the Contractor shall have the equipment and all its supports, hangers, etc., painted to match the room decor. Painting shall be performed as described in project specifications.

C. Equipment cabinets, casings, covers, metal jackets, etc., located in equipment rooms or concealed spaces, shall be furnished in standard finish, free from scratches, abrasions, chippings, etc.

D. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with baked enamel finish coat free from scratches, abrasions, chipping, etc. If color option is specified or is standard to the unit, verify with the Architect the color preference before ordering.

3.9 ADJUST AND CLEAN

A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project.

B. Clean all foreign paint, grease, oil, dirt, dust, labels, stickers, etc. from all equipment.

C. Remove all rubbish, debris, etc., accumulated during construction from the premises.

3.10 SPECIAL REQUIREMENTS

A. Coordinate the installation of all equipment, controls, devices, etc., with other trades to maintain clear access area for servicing.

B. Install all equipment to maximize access to parts needing service or maintenance. Review the final location, placement, and orientation of equipment with the Owner's representative prior to setting equipment.

C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's representative will result in removal and reinstallation of the equipment at the Contractor's expense.

D. Raceway and Cable Routing Restrictions: Raceways and cable are restricted from being routed in the following locations, unless serving the space or permitted by the authority having jurisdiction.

1. Cells.
2. Circulation/Vestibule.
3. Hard interview.
4. Technology, data, server rooms.
5. Normal power in emergency power equipment rooms: Limited to feeders and branch circuits serving the emergency power equipment located in the room.
6. Emergency power in normal power equipment rooms: Limited to feeders and branch circuits serving the normal power equipment located in the room.

3.11 INDOOR AIR QUALITY (IAQ) MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION

A. Within the Limits of Construction:

1. The Electrical Contractor shall coordinate all work with the contractor responsible for IAQ.
2. The means, methods and materials used by the Electrical Contractor shall be coordinated with the contractor responsible for IAQ and shall comply with the IAQ requirements set forth in Division 1 and Division 21/22/23 of these specifications.

B. Outside the Limits of Construction:

1. IAQ shall be the responsibility of the electrical contractor for work that is required outside the limits of construction.

2. The Electrical Contractor is responsible for the IAQ set forth in Division 1 and Division 21/22/23 of these specifications.
3. The Electrical Contractor shall review and coordinate all IAQ plans and procedures with the owner's IAQ representative.

C. Contractors shall make all reasonable efforts to prevent construction activities from affecting the air quality of the occupied areas of the building or outdoor areas near the building. These measures shall include, but not be limited to:

1. General Contractor shall erect and maintain dust barriers throughout the construction work. These barriers shall be reasonably airtight and shall prevent entry into the construction zone by unauthorized persons. Reasonably airtight means construction equivalent to full-height temporary or permanent walls with joints taped or sealed, and shafts and other penetrations sealed as well as possible. Fire resistant polyethylene is acceptable; if flame spread/smoke developed ratings are demonstrated to conform to the applicable building codes and licensing acts.

2. All contractors shall endeavor to minimize the amount of contaminants generated during construction. Methods to be employed shall include, but not be limited to:

    a. Minimizing the amount of dust generated.
    b. Reducing solvent fumes and VOC emissions.
    c. Maintain good housekeeping practices, including sweeping and periodic dust and debris removal. There should be no visible haze in the air.

3. Request that the Owner designate an IAQ representative.
4. Review and receive approval from the Owner's IAQ representative for all IAQ-related construction activities and negative pressure containment plans.
5. Inform the IAQ representative of all conditions that could adversely impact IAQ, including operations that will produce higher than normal dust production or odors.
6. Schedule activities that may cause IAQ conditions that are not acceptable to the Owner's IAQ representative during unoccupied periods.
7. Request copies of and follow all Owner's IAQ and infection control policies.
8. Unless no other access is possible, the entrance to construction site shall not be through the existing facility.
9. To minimize growth of infectious organisms, do not permit damp areas in or near the construction area to remain for over 24 hours.
10. In addition to the criteria above, provide measures as recommended in the SMACNA "IAQ Guidelines for Occupied Buildings under Construction".

3.12 SYSTEM STARTING AND ADJUSTING

A. The electrical systems shall be complete and operating. System startup, testing, adjusting, and balancing to obtain satisfactory system performance is the responsibility of the Contractor. This includes all calibration and adjustment of electrical controls, balancing of loads, troubleshooting and verification of software, and final adjustments that may be needed.

B. Complete all manufacturer-recommended startup procedures and checklists to verify proper equipment operation and does not pose a danger to personnel or property.

C. All operating conditions and control sequences shall be tested during the start-up period. Testing all interlocks, safety shut-downs, controls, and alarms.

D. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to ensure that all systems perform properly. If the Architect/Engineer is requested to visit the job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period, through no fault of the design; the Contractor shall reimburse the Owner on a time and materials basis for services rendered at the Architect/Engineer's standard hourly rates in effect when the services are requested. The Contractor shall pay the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

3.13 FIELD QUALITY CONTROL

A. General:

1. Conduct all tests required during and after construction. Submit test results in NETA format, or equivalent form, that shows the test equipment used, calibration date, tester's name, ambient test conditions, humidity, conductor length, and results corrected to 40°C.
2. Supply necessary instruments, meters, etc., for the tests. Supply competent technicians with training in the proper testing techniques.
3. All cables and wires shall be tested for shorts and grounds following installation and connection to devices. Replace shorted or grounded wires and cables.
4. Any wiring device, electrical apparatus or luminaire, if grounded or shorted on any integral "live" part, shall have all defective parts or materials replaced.
5. Test cable insulation of service and panel feeder conductors for proper insulation values. Tests shall include the cable, all splices, and all terminations. Each conductor shall be tested and shall test free of short circuits and grounds and have an insulation value not less than Electrical Code Standards. Take readings between conductors, and between conductors and ground.
6. If the results obtained in the tests are not satisfactory, make adjustments, replacements, and changes as needed. Then repeat the tests, and make additional tests, as the Architect/Engineer or authority having jurisdiction deems necessary.

B. Ground Resistance:

1. Conduct service ground resistance tests using an approved manufactured ground resistance meter. Submit to the Architect/Engineer a proposed test procedure including type of equipment to be used. (The conventional ohmmeter is not an acceptable device.)
2. Make ground resistance measurements during normal dry weather and not less than 48 hours after a rain. If the ground resistance value obtained is more than the value set forth in Section 26 05 26, the following shall be done to obtain the value given:

a. Verify that all connections in the service ground system are secure.
b. Increase the depth to which ground rods are driven by adding section lengths to the rods and retest. If the resistance is still excessive increase the depth by adding an additional rod section and retest.
c. If the resistance is still excessive, furnish and install additional ground rods, spaced not less than 20 feet from other ground rods unless otherwise noted on plans, and connect into the ground electrode system. Retest.
d. Review results with the Architect/Engineer.

3. Before final payment is made to the Contractor submit a written report to the Architect/Engineer including the following:

a. Date of test.
b. Number of hours since the last rain.
c. Soil condition at the time of the test in the ground electrode location. That is: dry, wet, moist, sand, clay, etc.
d. Diagram of the test set-up showing distances between test equipment, ground electrode, auxiliary electrodes, etc.
e. Make, model, and calibration date of test equipment.
f. Tabulation of measurements taken and calculations made.

C. Ground-Fault Equipment Performance Testing:

1. Test: Perform ground-fault performance testing when system is installed. The test process shall use primary current injection per manufacturer instruction and procedures. Perform test for the following:

a. Service disconnects
b. Solid state molded case circuit breakers and solid-state insulated case circuit breakers equipped with ground fault protection.
c. Fusible switches with ground fault relay protection.
d. Outside branch circuits and feeders.
e. Code required.

2. Report: Provide copy of test result report with Operation and Maintenance manuals. Provide report to Authority Having Jurisdiction when requested.

3.14 UTILITY REBATE

A. Submit utility rebate forms, where offered at project location, with rebate items completed. Rebate may include lighting, lighting controls, variable speed drives, heat pumps, package terminal A/C, air conditioners, chillers, water heaters, programmable thermostats, and motors.

B. Contractor must submit notification of any value engineering or product substitution that will affect the utility rebate amount prior to approval.

READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

To prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to your requesting a final job observation.

1. Penetrations of fire-rated construction fire sealed in accordance with specifications.
2. Electrical panels have typed circuit identification.
3. Per Section 26 05 00, cable insulation test results have been submitted.
4. Per Section 26 05 00, ground resistance test results have been submitted.
5. Operation and Maintenance manuals have been submitted as per Section 26 05 00.
6. Bound copies of approved shop drawings have been submitted as per Section 26 05 00.
7. Report of instruction of Owner's representative has been submitted as per Section 26 05 00.
8. Fire alarm inspection and testing report has been submitted as per Sections 26 05 00 and 28 31 00.
9. Start-up reports from factory representative have been submitted as per Section 26 05 00.

Accepted by:

Prime Contractor _____

By _____ Date _____

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Architect/Engineer so that the final observation can be scheduled.

It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

END OF SECTION 26 05 00

SECTION 26 05 05 ELECTRICAL DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electrical demolition

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work shall be as specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. THE DRAWINGS ARE INTENDED TO INDICATE THE SCOPE OF WORK REQUIRED AND DO NOT INDICATE EVERY BOX, CONDUIT, OR WIRE THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO SUBMITTING A BID AND VERIFY EXISTING CONDITIONS.

B. Where walls, ceilings, structures, etc., are indicated as being removed on general or electrical drawings, the Contractor shall be responsible for the removal of all electrical equipment, devices, fixtures, raceways, wiring, systems, etc., from the removed area.

C. Where ceilings, walls, structures, etc., are temporarily removed and replaced by others, this Contractor shall be responsible for the removal, storage, and replacement of equipment, devices, fixtures, raceways, wiring, systems, etc.

D. Where mechanical or technology equipment is indicated as being removed on electrical, mechanical, or technology drawings, the Contractor shall be responsible for disconnecting the equipment and removing all starters, VFD, controllers, electrical equipment, raceways, wiring, etc. associated with the device.

E. Verify that abandoned wiring and equipment serve only abandoned equipment or facilities. Extend conduit and wire to facilities and equipment that will remain in operation following demolition. Extension of conduit and wire to equipment shall be compatible with the surrounding area. Extended conduit and conductors to match existing size and material.

F. Coordinate scope of work with all other Contractors and the Owner at the project site. Schedule removal of equipment and electrical service to avoid conflicts.

G. Bid submittal shall mean the Contractor has visited the project site and has verified existing conditions and scope of work.

3.2 PREPARATION

A. The Contractor shall obtain approval from the Owner before turning off power to circuits, feeders, panels, etc. Coordinate all outages with Owner.

B. Coordinate utility service outages with Utility Company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations. Assume all equipment and systems must remain operational unless specifically noted otherwise on drawings.

D. Disconnect electrical systems in walls, floors, structures, and ceilings scheduled for removal.

E. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area. Service changeover shall be completed on an overtime basis.

F. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Obtain permission from Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area. Provide a watchman to make required premise observations during all outages, requirements as dictated by codes and Owner's insurance carrier.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of Division 1 of Specifications and this Section.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring and raceway to source of supply. Existing conduit in good condition may be reused in place by including an equipment ground conductor in reused conduit. Reused conduit and boxes shall have supports revised to meet current codes. Relocating conduit shall not be allowed.

D. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces. Remove all associated clamps, hangers, supports, etc. associated with raceway removal.

E. Disconnect and remove outlets and devices that are to be demolished. **Remove conduit, supports, and conductors back to source. Devices' back box and conduit mounted in walls that are to remain can be abandoned in place. Provide appropriate cover plate for all abandoned back boxes. Cover plates shall match existing plates used in the adjacent areas.** Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

F. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories. Ballasts in light fixtures installed prior to 1980 shall be incinerated in EPA approved incinerator or disposed of in EPA certified containers and deposited in an EPA landfill certified for PCB disposal or recycled by permitted ballast recycler. Punctured or leaking ballasts must be disposed of according to Federal Regulations under the Toxic Substance Control Act. Provide Owner and Architect/Engineer with a Certificate of Destruction to verify proper disposal.

G. Maintain access to existing electrical installations that remain active. Modify installation or provide junction boxes and access panel as appropriate.

H. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified. Extended conduit and conductors to match existing size and material.

I. HID and fluorescent lamps, determined by the Toxicity Characteristic Leachate procedure (TCLP), to be hazardous waste shall be disposed of in an EPA-permitted hazardous waste disposal facility or by a permitted lamp recycler.

J. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

K. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that remain or are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

C. ELECTRICAL ITEMS (E.G., LIGHTING FIXTURES, RECEPTACLES, SWITCHES, CONDUIT, WIRE, ETC.) REMOVED AND NOT RELOCATED REMAIN THE PROPERTY OF THE OWNER. CONTRACTOR SHALL PLACE ITEMS RETAINED BY THE OWNER IN A LOCATION COORDINATED WITH THE OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DISPOSAL OF MATERIAL THE OWNER DOES NOT WANT.

3.5 INSTALLATION

A. Install relocated materials and equipment under the provisions of Division 1 of Specifications.

END OF SECTION

SECTION 26 05 13 - WIRE AND CABLE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Building wire

B. Cabling for remote control, signal, and power limited circuits

1.2 RELATED WORK

A. Section 26 05 53 - Electrical Identification: Refer to electrical identification for color and identification labeling requirements.

1.3 REFERENCES

A. NFPA 70 - National Electrical Code (NEC)UL 44 - Thermoset-Insulated Wires and Cables

B. UL 83 - Thermoplastic-Insulated Wires and Cables

C. UL 854 - Service-Entrance Cables

D. UL 1581 - Standard for Electrical Wires, Cables, and Flexible Cords

1.4 SUBMITTALS

A. Submit shop drawings and product data under the provisions of Section 26 05 00.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

A. Feeders and Branch Circuits 8 AWG and larger: Copper, stranded conductor, 600-volt insulation, THHN/THWN or XHHW-2.

B. Feeders and Branch Circuits 8 AWG and larger in Underground Conduit: Copper, stranded conductor, 600-volt insulation, THWN or XHHW-2.

C. Feeders and Branch Circuits 10 AWG and Smaller: Copper, solid or stranded conductor, 600-volt insulation, THHN/THWN, unless otherwise noted on the drawings.

D. Motor Feeder from Variable Frequency Drives: Copper conductor, 600-volt XHHW-2 insulation, stranded conductor, unless otherwise noted on the drawings. Three conductor stranded copper, 600-volt XHHW-2 insulation, with copper ground and overall helical copper tape shield. Shield shall be terminated at both ends of cable with an approved termination.

E. Control Circuits: Copper, stranded conductor 600-volt insulation, THHN/THWN.

F. Each 120 and 277-volt branch circuit shall have a dedicated neutral conductor. Neutral conductors shall be considered current-carrying conductors for wire derating.

2.2 CABLING FOR REMOTE CONTROL, SIGNAL, AND POWER LIMITED CIRCUITS

A. Wire for the following specialized systems shall be as designated on the drawings, or elsewhere in these specifications. If not designated on the drawings or specifications, the system manufacturer's recommendations shall be followed.

1. Fire alarm

PART 3 - EXECUTION

3.1 WIRE AND CABLE INSTALLATION SCHEDULE

A. Above Accessible Ceilings:

1. Building wire shall be installed in raceway.

B. All Other Locations: Building wire in raceway.

C. Above Grade: All conductors installed above grade shall be type "THHN".

D. Underground or In Slab: All conductors shall be type "THWN".

E. Low Voltage Cable (less than 100 volts): Low voltage cables in ducts, plenums, and other air handling spaces shall be plenum listed. Low voltage cables in non-accessible areas shall be installed in conduit. Low voltage cable may be installed without conduit in accessible areas using the following types of cable supports. Cable support types/systems shall comply with the warranty requirements of the low voltage cable manufacturer.

1. J-hooks
2. Bridle rings with saddle supports

3.2 CONTRACTOR CHANGES

A. The basis of design is copper conductors installed in raceway based on ambient temperature of 30°C, Service entrance conductors are based on copper conductor installed in underground electrical ducts.

B. The Contractor shall be responsible for derating and sizing conductors and conduits to equal or exceed the ampacity of the basis of design circuits, if he/she chooses to use methods or materials other than the basis of design.

C. Conductor length(s) listed on plans and schedules. The drawings are diagrammatic with intent to convey the components of the electrical distribution system. Conductor length(s) when listed on plans and schedules are for engineering calculation purposes. Conductor length(s) shall NOT be used for bidding purposes.

D. Record drawing shall include the calculations and sketches.

3.3 GENERAL WIRING METHODS

A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for control wiring.

B. Use no wire smaller than 18 AWG for low voltage control wiring below 100 volts.

C. Use 10 AWG conductor for 20 ampere, 120-volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277-volt branch circuit home runs longer than 200 feet.

D. Use no wire smaller than 8 AWG for outdoor lighting circuits.

E. The ampacity of multiple conductors in one conduit shall be derated per the Electrical Code. In no case shall more than 4 conductors be installed in one conduit to such loads as motors larger than 1/4 HP, panelboards, motor control centers, etc.

F. Where installing parallel feeders, place an equal number of conductors for each phase of a circuit in same raceway or cable.

G. Splice only in junction or outlet boxes.

H. Neatly train and lace wiring inside boxes, equipment, and panelboards.

I. Make conductor lengths for parallel circuits equal.

J. All conductors shall be continuous in conduit from last outlet to their termination.

K. Terminate all spare conductors on terminal blocks and label the spare conductors.

L. Cables or wires shall not be laid out on the ground before pulling.

M. Cables or wires shall not be dragged over earth or paving.

N. Care shall be taken so as not to subject the cable or wire to high mechanical stresses that would cause damage to the wire and cable.

O. At least six (6)-inch loops or ends shall be left at each outlet for installation connection of luminaires or other devices.

P. All wires in outlet boxes not connected to fixtures or other devices shall be rolled up, spliced if continuity of circuit is required, and insulated.

3.4 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.

B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

C. Pulling shall be continuous without unnecessary stops and starts with wire or cable only partially through raceway.

D. Where reels of cable or wire are used, they shall be set up on jacks close to the point where the wire or cable enters the conduit or duct so that the cable or wire may be unreeled and run into the conduit or duct with a minimum of change in the direction of the bend.

E. Conductors shall not be pulled through conduits until plastering or masonry work is completed and conduits are free from moisture. Care shall be taken so that long pulls of wire or pulls around several bends are not made where the wire may be permanently stretched and the insulation damaged.

F. Only nylon rope shall be permitted to pull cables into conduit and ducts.

G. Completely and thoroughly swab raceway system before installing conductors.

3.5 CABLE INSTALLATION

A. Provide protection for exposed cables where subject to damage.

B. Use suitable cable fittings and connectors.

C. Run all open cable parallel or perpendicular to walls, ceilings, and exposed structural members. Follow the routing as illustrated on the drawings as closely as possible. Cable routing on drawings scaled 1/4"=1'-0" or less shall be considered diagrammatical, unless noted otherwise. The correct routing, when shown diagrammatically, shall be chosen by the Contractor based on information in the contract documents; in accordance with the manufacturer's written instructions, applicable codes, the NECA's "Standard of Installation", recognized industry standards; and coordinated with other contractors.

D. Open cable shall be supported by the appropriate size J-hooks or other means if called for on the drawings. Wire and cable from different systems shall not be installed in the same J-hook. J-hooks shall be sized with 20% spare capacity. J-hooks shall provide proper bend radius support for data cable and fiber cables.

E. Open cable installed above suspended ceilings shall not rest on the suspended ceiling construction, nor utilize the ceiling support system for wire and cable support.

F. J-hook support spans shall be based on the smaller of the manufacturer's load ratings and code requirements. In no case shall horizontal spans exceed 5 feet and vertical spans exceed 4 feet. All J-hooks shall be installed where completely accessible and not blocked by piping, ductwork, inaccessible ceilings, etc. J-hooks shall be independently rigidly attached to a structural element. J-hooks shall be installed to provide 2" horizontal separation and 6" vertical separation between systems.

G. Open cable shall only be installed where specifically shown on the drawings or permitted in these specifications.

3.6 WIRING CONNECTIONS AND TERMINATIONS

A. Splice and tap only in accessible junction boxes.

B. Use solderless, tin-plated copper, compression terminals (lugs) applied with circumferential crimp for conductor terminations, 8 AWG and larger.

C. Use solderless, tin-plated, compression terminals (lugs) applied with indenter crimp for copper conductor terminations, 10 AWG and smaller.

D. Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps.

E. Use compression connectors applied with circumferential crimp for conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.

F. Thoroughly clean wires before installing lugs and connectors.

G. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

H. Phase Sequence: All apparatus shall be connected to operate in the phase sequence A-B-C representing the time sequence in which the phase conductors so identified reach positive maximum voltage.

I. As a general rule, applicable to switches, circuit breakers, starters, panelboards and the like, the connections to phase conductors are intended thus:

1. Facing the front and operating side of the equipment, the phase identification shall be:

a. Left to Right - A-B-C
b. Top to Bottom - A-B-C

J. Connection revisions as required to achieve correct rotation of motors shall be made at the load terminals of the starters or disconnect switches.

3.7 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. Building Wire and Power Cable Testing: Perform an insulation-resistance test on each conductor with respect to ground and adjacent conductors. Test shall be made by means of a low-resistance ohmmeter, such as a "Megger". The applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. The test duration shall be one minute. Insulation resistance must be greater than 100 mega-ohm for 600 volt and 25 mega-ohm for 300 volt rated cables per NETA Acceptance Testing Standard. Verify uniform resistance of parallel conductors.

C. Inspect wire and cable for physical damage and proper connection.

D. Torque test conductor connections and terminations to manufacturer's recommended values.

E. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

F. Provide documentation of the manufacturer's recommended lug torque value for copper and aluminum conductors, the date the lugs were torqued, and installed torque readings. Documentation indicating that the torque wrench has been calibrated not more than 30 days prior to tightening of lugs shall be provided.

G. Protection of wire and cable from foreign materials:

1. It is the Contractor's responsibility to provide adequate physical protection to prevent foreign material application or contact with any wire or cable type. Foreign material is defined as any material that would negatively impact the validity of the manufacturer's performance warranty. This includes, but is not limited to, overspray of paint (accidental or otherwise), drywall compound, or any other surface chemical, liquid, or compound that could come in contact with the cable, cable jacket, or cable termination components.

H. Overspray of paint on any wire or cable will not be accepted. It shall be the Contractor's responsibility to replace any component containing overspray, in its entirety, at no additional cost to the project. Cleaning of the cables with harsh chemicals is not allowed.

END OF SECTION 26 05 13

SECTION 26 05 26 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Equipment grounding system

B. Bonding system

C. Grounding electrode system

1.2 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.

B. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association to supervise on-site testing specified in Part 3.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in Electrical Code, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with UL 467 Grounding and Bonding Equipment.

1.3 REFERENCES

A. NFPA 70 - National Electrical Code (NEC)

1.4 SUBMITTALS

A. Submit shop drawings under provisions of Section 26 05 00.

B. Product Data: For each type of product indicated.

C. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Indicate layout of ground field, location of system grounding electrode connections, and routing of grounding electrode conductor and ground ring.

1.5 SUMMARY

A. This section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 26 Section 26 05 13 "Wire and Cable".

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated. Refer to Section 26 05 53 for insulation color.

D. Isolated Ground Conductors: Insulated. Refer to Section 26 05 53 for insulation color.

E. Grounding Electrode Conductors: Stranded cable.

F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

G. Copper Bonding Conductors: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

H. GB; Grounding Bar:

1. Bare, annealed copper bars of rectangular cross section, with insulators. 1/4" x 2", length of technology or applicable room.

I. IBT; Intersystem Bonding Termination:

1. Copper bar, 1/4" x 2" x 24". Provide with wall mounting brackets, insulators and pre-tapped holes.
2. Manufacturers:

a. Harger GBI Series.
b. Erico EGB Series.

2.2 CONNECTOR PRODUCTS

A. Comply with UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Connectors: Hydraulic compression type, in kit form, and selected per manufacturer's written instructions.

C. Bolted Connectors: Bolted-pressure-type connectors.

2.3 GROUNDING ELECTRODES

A. Ground Rods Copper-clad steel.

B. Concrete-Encased Grounding Electrode (Ufer): Fabricate according to Electrical Code, using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG or 20 feet of 1/2"steel reinforcing bar.

PART 3 - EXECUTION

3.1 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

D. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

E. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

F. Structural Steel Connection: Exothermic-welded connections to structural steel. Coordinate with structure to provide physical protection.

G. Underground Connections: Hydraulic compression connection. Use for underground connections.

H. Connections at back boxes, junction boxes, pull boxes, and equipment terminations: The equipment grounding conductor(s) associated with all circuits in the box shall be connected together and to the box using a suitable grounding screw. The removal of the respective receptacle, luminaire, or other device served by the box shall not interrupt the grounding continuity.

I. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

J. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.2 INSTALLATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage. Each grounding conductor that passes through a below grade wall must be provided with a waterstop.

C. Grounding electrode conductor (GEC) shall be protected from physical damage by rigid polyvinyl chloride conduit (PVC) in exposed locations.

D. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then use a bolted clamp. Bond straps directly to the basic structure, taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

E. In raceways, use insulated equipment grounding conductors.

F. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade.

G. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment and elsewhere as indicated, with bolted connections to form a continuous ground path.

3.3 EQUIPMENT GROUNDING SYSTEM

A. Comply with Electrical Code, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by Electrical Code are indicated.

B. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by Electrical Code:

1. Lighting and receptacle circuits. Terminate each end on a grounding lug or bus.
2. Single-phase and three-phase motor and appliance branch circuits.
3. Flexible raceway runs, including FMC and LFMC.

C. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.

D. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

3.4 BONDING SYSTEM

A. At building expansion joints, provide flexible bonding jumpers to connect to columns or beams on each side of the expansion joint.

B. Isolated Equipment Enclosure: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure and install a separate equipment bonding conductor.

C. Exterior Metallic Pull and Junction Box Covers, Metallic Hand Rails: Bond to grounding system using flexible grounding conductors.

D. Equipment Circuits: Install a bonding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, dampers, and heaters. Bond conductor to each unit and to air duct. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps or copper conductor sized equal to the equipment grounding conductor.

E. Water Heater, Heat-Tracing, Metal Well Casing, and Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and anti-frost heating cable. Bond conductor to heater units, piping, well casing, connected equipment, and components.

F. Connect bonding conductors to metal water pipe using a suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter.

G. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 6 AWG minimum insulated bonding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet. Leave 10 feet of slack conductor at terminal board.

H. Telecom Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bar.

I. Remote control, signaling, and fire alarm circuits shall be bonded in accordance with the most recent version of the National Electric Code.

J. Metal Poles Supporting Outdoor Lighting Fixtures > 15 feet: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

3.5 GROUNDING ELECTRODE SYSTEM

A. Ground Ring (Counterpoise):

1. Ground the steel framework of the building with a driven ground rod at the base of every corner column and at intermediate exterior columns at average distances not more than 60 feet apart. Provide a grounding conductor, electrically connected to each ground rod and to each steel column, extending around the perimeter of the building. Use tinned-copper conductor not less than No. 2 AWG for ground ring and for tap to building steel. Bury conductor not less than 30 inches below grade, 24 inches from building foundation, and 18 inches outside of roof drip line.

B. Supplementary Grounding Electrode: Use driven ground rod on exterior of building.

C. Ground Rods: Install at least two rods spaced at least 20 feet from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 12 inches below finished floor or final grade, unless otherwise indicated.
2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds. Make connections without exposing steel or damaging copper coating.

D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters, filtering devices, and similar equipment. Connect to pipe with grounding clamp connectors.

F. Natural Gas Service Piping: Bond to natural gas main service with grounding clamp connectors. Bonding conductor shall be connected to the main service ground bar. Provide grounding jumpers around all breaks in metallic continuity.

G. Concrete-Encased Grounding Electrode (Ufer):Install concrete-encased grounding electrode encased in at least 2 inches of concrete horizontally within the foundation that is in contact with the earth. If concrete foundation is less than 20 feet long, coil excess conductor within the base of the foundation. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

3.6 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

1. Measure ground resistance from system neutral connection at service entrance to convenient ground reference points using suitable ground testing equipment. Resistance shall not exceed 5 ohms.
2. Testing: Perform the following field quality-control testing:

    a. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
    b. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

3.7 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 2. Maintain restored surfaces. Restore disturbed paving.

END OF SECTION 26 05 26

SECTION 26 05 27 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conduit and Equipment Supports

B. Fastening Hardware

C. Concrete Housekeeping Pads

D. Foundation and Underground Sleeves and Seals

1.2 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

1.3 COORDINATION

A. Coordinate size, shape and location of concrete pads with section on Cast-in-Place Concrete or Concrete Topping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Allied Support Systems

B. Cooper B-Line

C. Erico, Inc.

D. Hilti

E. Power Fasteners

F. Orbit Industries

2.2 MATERIAL

A. Support Channel: Hot-dip galvanized; painted steel for interior/dry locations. All field cut ends shall be touched up with matching finish to inhibit rusting.

B. Hardware: Corrosion resistant.

C. Anchorage and Structural Attachment Components:

1. Strength: Defined in reports by ICBO Evaluation Service or another agency acceptable to Authorities Having Jurisdiction.

    a. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.

2. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.
3. Beam clamps for Steel Beams and Joists: Double sided or concentric open web joist hangars. Single-sided type is not acceptable.
4. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.
5. Concrete Anchors: Fasten to concrete using cast-in or post-installed anchors designed per the requirements of Appendix D of Post-installed anchors shall be qualified for use in cracked concrete by ACI-355.2.
6. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or self-tapping masonry screws. For expansion anchors into hollow concrete block, use sleeve-type anchors designed for the specific application. Do not fasten in masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic inserts.

2.3 FOUNDATION - UNDERGROUND SLEEVES AND SEALS

A. Wall Seals ("Link-Seals"):

1. Where shown on the drawings, raceways passing through foundation walls to an underground condition shall have their annual space (sleeve or drilled hole “” not tapered hole made with knockout plug) sealed by properly sized sealing element consisting of a synthetic rubber material compounded to resist aging, ozone, sunlight, water and chemical action.
2. Sleeves, if used, shall be standard weight steel with primed finish and waterstop/anchor continuously welded to sleeve.
3. Sleeves shall be at least 2 trade sizes larger than the penetrating raceway.
4. Pressure shall be maintained by stainless steel bolts and accessories. Pressure plates may be of composite materials for Models S and OS.

5. Approved Manufacturers:

    a. Thunderline Corporation "Link-Seals"
    b. O-Z/Gedney Company
    c. Calpico, Inc
    d. Innerlynx

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors in concrete and beam clamps on structural steel.

B. Trapeze support installation: Cut hanger rods back at trapeze supports so they do not extend more than 3/4" below bottom face of lowest fastener and blunt any sharp edges.

C. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

D. Do not fasten supports to ceiling systems, piping, ductwork, mechanical equipment, or conduit, unless otherwise noted.

E. Do not use powder-actuated anchors without specific permission.

F. Do not drill structural steel members.

G. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

H. In wet locations and on all building floors below exterior earth grade install free-standing electrical equipment on concrete pads.

I. Install cabinets and panelboards with minimum of four anchors. Provide horizontal backing/support framing in stud walls for rigid mounting. Provide steel channel supports to stand surface-mounted panelboard or cabinet one inch off wall.

J. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

K. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (excludes concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and mechanical items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.

L. Refer to Section 26 05 33 for special conduit supporting requirements.

3.2 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports above suspended ceiling spaces are not considered exposed.

B. Trim all ends of exposed field fabricated steel hangers, slotted channel and threaded rod to within 1" of support or fastener to eliminate potential injury to personnel unless shown otherwise on the drawings. Smooth ends and install elastomeric insulation with two coats of latex paint if exposed steel is within 6'-6" of finish floor and presents potential injury to personnel.

END OF SECTION 26 05 27

SECTION 26 05 33 - CONDUIT AND BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Rigid metallic conduit and fittings (RMC)

B. Electrical metallic tubing and fittings (EMT)

C. Flexible metallic conduit and fittings (FMC)

D. Liquidtight flexible metallic conduit and fittings (LFMC)

E. Rigid polyvinyl chloride conduit and fittings (PVC)

F. High density polyethylene conduit and fittings (HDPE)

G. Wall and ceiling outlet boxes

H. Electrical connection

I. Pull and junction boxes

J. Rough-ins

K. Handholes

1.2 RELATED WORK

A. Section 26 05 53 - Electrical Identification: Refer to electrical identification for color and identification labeling requirements.

1.3 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated
2. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated and Fittings
3. ANSI C80.4 - Fittings for Rigid Metal Conduit and Electrical Metallic Tubing
4. ANSI C80.6 - Intermediate Metal Conduit, Zinc Coated
5. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports
6. ANSI/NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports

B. NECA "Standards of Installation"

C. National Electrical Manufacturers Association (NEMA):

1. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable
2. RN 1 - Polyvinyl chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit, Rigid Aluminum Conduit, and Intermediate Metal Conduit
3. TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit
4. TC 9 - Fittings for PVC Plastic Utilities Duct for Underground Installation

D. NFPA 70 - National Electrical Code (NEC)

E. Underwriters Laboratories (UL): Applicable Listings

1. UL 1 - Flexible Metal Conduit
2. UL 6 - Rigid Metal Conduit
3. UL 360 - Liquid Tight Flexible Steel Conduit
4. UL514-B - Conduit Tubing and Cable Fittings
5. UL651-A - Type EB and a PVC Conduit and HDPE Conduit
6. UL651-B - Continuous Length HDPE Conduit
7. UL746A - Standard for Polymeric Materials - Short Term Property Evaluations
8. UL797 - Electrical Metal Tubing
9. UL1242 - Intermediate Metal Conduit

F. American Standard of Testing and Materials (ASTM):

1. ASTM D 570 - Standard Test Method for Water Absorption of Plastics
2. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics
3. ASTM D 648 - Standard Test Method for Deflection Temperature of Plastics under Flexural Load in the Edge Wise Position
4. ASTM D 2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
5. ASTM D 2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter
6. ASTM D 3350 - Standard Specification for Polyethylene Plastic Pipe and Fittings Material

G. Definitions:

1. Fittings: Conduit connection or coupling.
2. Body: Enlarged fittings with opening allowing access to the conductors for pulling purposes only.
3. Mechanical Spaces: Enclosed areas, usually kept separated from the general public, where the primary use is to house service equipment and to route services. These spaces generally have exposed structures, bare concrete and non-architecturally emphasized finishes.
4. Finished Spaces: Enclosed areas where the primary use is to house personnel and the general public. These spaces generally have architecturally emphasized finishes, ceilings and/or floors.
5. Concealed: Not visible by the general public. Often indicates a location either above the ceiling, in the walls, in or beneath the floor slab, in column coverings, or in the ceiling construction.

6. Above Grade: Not directly in contact with the earth. For example, an interior wall located at an elevation below the finished grade shall be considered above grade but a wall retaining earth shall be considered below grade.
7. Slab: Horizontal pour of concrete used for a floor or sub-floor.

1.4 SUBMITTALS

A. Include fittings and conduits 1.5" and larger in coordination files. Include all in--floor and underfloor conduit in coordination files. Refer to Section 26 05 00 for coordination drawing requirements.

PART 2 - PRODUCTS

2.1 RIGID METALLIC CONDUIT (RMC) AND FITTINGS

A. Manufacturers:

1. Allied
2. LTV
3. Steelduct
4. Calbond Calpipe
5. Wheatland Tube Co
6. O-Z Gedney
7. or approved equal.

B. Manufacturers of RMC Conduit Fittings:

1. Appleton Electric
2. O-Z/Gedney Co.
3. Electroline
4. Raco
5. Bridgeport
6. Midwest
7. Regal
8. Thomas & Betts
9. Crouse-Hinds
10. Killark
11. Orbit Industries
12. or approved equal.

C. Minimum Size Galvanized Steel: 3/4 inch, unless otherwise noted.

D. Fittings and Conduit Bodies:

1. End Bell Fittings: Malleable iron, hot dip galvanized, threaded flare type with provisions for mounting to form.
2. Expansion Joints: Malleable iron and hot dip galvanized providing a minimum of 4 inches of movement. Fitting shall be watertight with an insulating bushing and a bonding jumper.

3. Expansion Joint for Concrete Encased Conduit: Neoprene sleeve with bronze end coupling, stainless steel bands and tinned copper braid bonding jumper. Fittings shall be watertight and concrete-tight.
4. Conduit End Bushings: Malleable iron type with molded-on high impact phenolic thermosetting insulation. Where required elsewhere in the contract documents, bushing shall be complete with ground conductor saddle and clamp. High impact phenolic threaded type bushings are not acceptable.
5. All other fittings and conduit bodies shall be of malleable iron construction and hot dip galvanized.

2.2 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. Minimum Size Electrical Metallic Tubing: 3/4 inch, unless otherwise noted.

B. Manufacturers of EMT Conduit:

1. Allied
2. Calbond Calpipe
3. LTV
4. Steelduct
5. Wheatland Tube Co

C. Fittings and Conduit Bodies:

1. Manufacturers of EMT Conduit Fittings:

a. Appleton Electric
b. O-Z/Gedney Co.
c. Electroline
d. Raco
e. Bridgeport
f. Midwest
g. Regal
h. Thomas & Betts
i. Orbit Industries

2.3 FLEXIBLE METALLIC CONDUIT (FMC) AND FITTINGS

A. Minimum Size Galvanized Steel: 3/4 inch, unless otherwise noted. Lighting branch circuit wiring to an individual luminaire may be a manufactured, UL listed 3/8" flexible metal conduit and fittings with #14 AWG THHN conductors and an insulated ground wire. Maximum length of 3/8" FMC shall be six (6) feet.

B. Manufacturers:

1. American Flex
2. Alflex
3. Electri-Flex Co

C. Construction: Flexible steel, approved for conduit ground, zinc coated, threadless type formed from a continuous length of spirally wound, interlocked zinc coated strip steel. Provide a separate equipment grounding conductor when used for equipment where flexibility is required.

D. Fittings and Conduit Bodies:

1. Threadless hinged clamp type, galvanized zinc coated cadmium plated malleable cast iron or screw-in type, die-cast zinc.
2. Fittings and conduit bodies shall include plastic or cast metal inserts supplied by the manufacturer to protect conductors from sharp edges.
3. Manufacturers:

a. O-Z/Gedney Co.
b. Thomas & Betts
c. Appleton Electric
d. Electroline
e. Bridgeport
f. Midwest
g. Regal
h. Orbit Industries

2.4 LIQUIDTIGHT FLEXIBLE METALLIC CONDUIT (LFMC) AND FITTINGS

A. Manufacturers:

1. Anaconda Type UA
2. Electri-Flex Type LA
3. Alflex
4. Carlon (Lamson & Sessions)

B. Construction: Flexible steel, approved for conduit ground, zinc coated, threadless type formed from a continuous length of spirally wound, interlocked zinc coated strip steel and an extruded PVC cover.

C. Fittings and Conduit Bodies:

1. Watertight, compression type, galvanized zinc coated cadmium plated malleable cast iron, UL listed.
2. Fittings and conduit bodies shall include plastic or cast metal inserts supplied by the manufacturer to protect conductors from sharp edges.
3. Manufacturers:

a. Appleton Electric
b. O-Z/Gedney Co.
c. Electroline
d. Bridgeport
e. Thomas & Betts
f. Midwest
g. Regal
h. Carlon (Lamson & Sessions)
i. Orbit Industries

2.5 RIGID NON-METALLIC CONDUIT (PVC) AND FITTINGS

A. Minimum Size Rigid Smooth-Wall Nonmetallic Conduit: 3/4 inch, unless otherwise noted.

B. Acceptable Manufacturers:

1. Carlon (Lamson & Sessions) Type 40
2. Cantex, J.M. Mfg.

C. Construction: Schedule 40 and Schedule 80 rigid polyvinyl chloride (PVC), UL labeled for 90°C.

D. Fittings and Conduit Bodies: NEMA TC 3; sleeve type suitable for and manufactured especially for use with the conduit by the conduit manufacturer.

E. Plastic cement for joining conduit and fittings shall be provided as recommended by the manufacturer.

2.6 HIGH DENSITY POLYETHYLENE (HDPE)

A. Minimum Size: 2 inch, unless noted otherwise.

B. Acceptable Manufacturers:

1. Carlon
2. Chevron Phillips Chemical Company

C. Materials used for the manufacture of polyethylene pipe and fittings shall be extra high molecular weight, high-density polyethylene resin. The material shall be listed by PPI (Plastic Pipe Institute) and shall meet the following resin properties:

ASTM Test	Description	Values HDPE
D-1505	Density g/CM 3	less than 0.941
D-1238	Melt Index, g/10 min Condition E	greater than 0.55 grams/10 min.
D-638	Tensile Strength at yield (psi)	3000 min.
D-1693	Environmental Stress Crack Resistance Condition B, F 20	96 hrs.
D-790	Flexural Modulus, MPa (psi)	less than 80,000
D-746	Brittleness Temperature	-75°C Max

D. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same raw material, including both the base resin and coextruded resin. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.

E. Fitting and Conduit Bodies:

1. Directional Bore and Plow Type Installation: Electrofusion or Universal Aluminum threaded couplings. Tensile strength of coupled pipe must be greater than 2,000 lbs.
2. Coupler must provide a water tight connection. The tensile strength of coupled pipe must be greater than 1,000 lbs.
3. E-loc type couplings are not acceptable in any situations.
4. Acceptable Manufacturers:

   a. ARCON
   b. Carlon

2.7 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel, 16 gauge (approximately 0.0625 inches), with 1/2-inch male fixture studs where required.

B. Nonmetallic Outlet Boxes: ANSI/NEMA OS 2.

C. Cast Boxes: Nema FB1, Type FD, Aluminum, cast feralloy, or stainless steel deep type, gasketed cover, threaded hubs.

D. Outlet boxes for luminaires to be not less than 1-1/2" deep, deeper if required by the number of wires or construction. The box shall be coordinated with surface luminaires to conceal the box from view or provide a finished trim plate.

E. Switch outlet boxes for local light control switches, dimmers and occupancy sensors shall be 4 inches square by 2-1/8 inches deep, with raised cover to fit flush with finish wall line. Multiple gang switch outlets shall consist of the required number of gang boxes appropriate to the quantity of switches comprising the gang. Where walls are plastered, provide a plaster raised cover. Where switch outlet boxes occur in exposed concrete block walls, boxes shall be installed in the block cavity with a raised square edge tile cover of sufficient depth to extend out to face of block or masonry boxes.

F. Outlet boxes for telephone substations in walls and columns shall be 4 inches square and 2-1/8 inches deep with single gang raised cover to fit flush with finished wall line equipped with flush telephone plate.

G. Wall or column receptacle outlet boxes shall be 4 inches square with raised cover to fit flush with finished wall line. Boxes in concrete block walls shall be installed the same as for switch boxes in block walls.

2.8 ECONN; ELECTRICAL CONNECTION

A. Electrical connection to equipment and motors, sized per Electrical Code. Coordinate requirements with contractor furnishing equipment or motor. Refer to specifications and general installation notes for terminations to motors.

2.9 JB; PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: ANSI/NEMA OS 1; galvanized steel.

B. Sheet metal boxes larger than 12 inches in any dimension that contain terminations or components: Continuous hinged enclosure with 1/4 turn latch and white back panel for mounting terminal blocks and electrical components.

C. Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250; Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as raintight. Galvanized cast iron box and cover with ground flange, neoprene gasket, and stainless steel cover screws.

D. Cast Metal Boxes for Underground Installations: NEMA 250; Type 4, inside flanged, recessed cover box for flush mounting, UL listed as raintight. Galvanized cast iron box and plain cover with neoprene gasket and stainless steel cover screws.

E. Flanged type boxes shall be used where installed flush in wall.

2.10 ROUGH-IN

A. Provide with one (1) flush mount double gang box with single gang plaster ring and appropriate cover plate,

B. Conduit stubbed to above the lay-in ceiling.

C. RI-TECH; Technology Rough-in:

1. Rough-in shall have one (1) 1" conduit.

D. RI-TECH-W; Technology Rough-in - Wall Phone:

1. Mount on wall +54" or as noted in plans. Rough-in shall have one (1) 1" conduit.

E. RI-TECH-C; Technology Rough-in - Ceiling Flush Mounted:

1. Mount flush in finished ceiling or as noted in plans. Rough-in shall have one (1) 1" conduit.

F. RI-TV; Television Antenna Outlet Box Rough-in:

1. Rough-in shall have one (1) 3/4" conduit.

2.11 HANDHOLES

A. HH-#; Handhole, composite polymer concrete body and cover. Stainless steel hardware. Bolted non-skid cover rated for 10,000 pounds. Design load occasional non-deliberate vehicular traffic. Stack units to achieve depth shown on plans. Units in landscaped areas shall be green in color. 11"W, 18"L, 18"D or dimensions as shown on plans.

PART 3 - EXECUTION

3.1 CONDUIT INSTALLATION SCHEDULE AND SIZING

A. In the event the location of conduit installation represents conflicting installation requirements as specified in the following schedule, a clarification shall be obtained from the Architect/Engineer. If this Contractor is unable to obtain a clarification as outlined above, concealed rigid galvanized steel conduit installed per these specifications and the Electrical Code shall be required.

B. Installation Schedule: Refer to drawings.

C. Size conduit as shown on the drawings and specifications. Where not indicated in the contract documents, conduit size shall be according to the Electrical Code. Conduit and conductor sizing shall be coordinated to limit conductor fill to less than 40%, maintain conductor ampere capacity as required by the Electrical Code (to include enlarged conductors due to temperature and quantity derating values) and to prevent excessive voltage drop and pulling tension due to long conduit/conductor lengths.

D. Minimum Conduit Size (Unless Noted Otherwise):

1. Above Grade: 3/4 inch. (The use of 1/2 inch would be allowed for installation conduit to individual light switches, individual receptacles and individual fixture whips from junction box.)
2. Below Grade 5' or less from Building Foundation: 1 inch.
3. Below Grade More than 5' from Building Foundation: 1 inch.
4. Telecommunication Conduit: 1 inch.
5. Controls Conduit: 3/4 inch.

E. Conduit Embedded in Slabs above Grade:

1. Embedded installation NOT allowed in elevated slabs with metal composite decks nor structural pour in place slabs less than 6 inches in depth unless specifically noted or shown on drawings otherwise.
2. Maximum size 3/4 inch for conduits crossing each other.

F. Conduit sizes shall change only at the entrance or exit to a junction box, unless specifically noted on the drawings.

3.2 CONDUIT ARRANGEMENT

A. In general, conduit shall be installed concealed in walls, in finished spaces and where possible or practical, or as noted otherwise. Conduit shall be installed parallel or perpendicular to walls, ceilings, and exposed structural members. In unfinished spaces, mechanical and utility areas, conduit may run either concealed or exposed as conditions dictate and as practical unless noted otherwise on drawings. Installation shall maintain headroom in exposed vicinities of pedestrian or vehicular traffic.

B. Exposed conduit on exterior walls or above roof will not be allowed without prior written approval of Architect/Engineer. A drawing of the proposed routing and a photo of the location shall be submitted 14 days prior to start of conduit rough-in. Routing shall be shown on coordination drawings.

C. Conduit arrangement in elevated slabs (restricted to applications specifically noted or shown on drawings):

1. Conduit size shall not exceed one-third of the structural slab thickness. Place conduit between the top and bottom reinforcing with a minimum of 3" concrete cover.
2. Parallel conduits shall be spaced at least 8 inches apart. Exception: Within 18 inches of commonly served floor boxes, junction boxes, or similar floor devices. Arrange conduits parallel or perpendicular to building lines and walls.

D. Conduit shall not share the same cell as structural reinforcement in masonry walls.

E. Conduit runs shall be routed as shown on large scale drawings. Conduit routing on drawings scaled 1/4"=1'-0" or less shall be considered diagrammatic, unless noted otherwise. The correct routing, when shown diagrammatically shall be chosen by the Contractor based on information in the contract documents, in accordance with manufacturer's written instructions, applicable codes, the NECA's "Standard of Installation", in accordance with recognized industry standards, and coordinated with other contractors.

F. Contractor shall adapt Contractor's work to the job conditions and make such changes as required and permitted by the Architect/Engineer, such as moving to clear beams and joists, adjusting at columns, avoiding interference with windows, etc., to permit the proper installation of other mechanical and/or electrical equipment.

G. Contractor shall cooperate with all contractors on the project. Contractor shall obtain details of other contractor's work to ensure fit and avoid conflict. Any expense due to the failure of This Contractor to do so shall be paid for in full by Contractor. The other trades involved as directed by the Architect/Engineer shall perform the repair of work damaged as a result of neglect or error by This Contractor. The resultant costs shall be borne by This Contractor.

3.3 CONDUIT SUPPORT

A. Conduit runs installed above a suspended ceiling shall be properly supported. In no case shall conduit rest on the suspended ceiling construction, nor utilize ceiling support system for conduit support.

1. Support wire used to independently support raceway and wiring systems above suspending ceilings shall be supported on both ends, minimum 12 gauge suspended ceiling support wire, and distinguishable from ceiling support systems by color (field paint), tagging, or equivalent means.

B. Conduit shall not be supported from ductwork, water, sprinkler piping, or other non-structural members, unless approved by the Architect/Engineer. All supports shall be from structural slabs, walls, structural members, and bar joists, and coordinated with all other applicable contractors, unless noted otherwise.

C. Conduit shall be held in place by the correct size of galvanized one-hole conduit clamps, two-hole conduit straps, patented support devices, clamp back conduit hangers, or by other means if called for on the drawings.

D. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

E. Spring-steel conduit clips specifically designed for supporting single conduits or tubing may be used in lieu of malleable-iron hangers for 1" and smaller raceways serving lighting and receptacle branch circuits above accessible ceilings and for securing raceways to slotted channel and angle supports.

F. Group conduits in parallel runs where practical and use conduit racks or trapeze hangers constructed of steel channel, suspended with threaded solid rods or wall mounted from metal channels with conduit straps or clamps. Provide space in each rack or trapeze for 25% additional conduits.

G. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (excludes concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and mechanical items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Supports for metallic conduit shall be no greater than 10 feet. A smaller interval may be used if necessitated by building construction, but in no event shall support spans exceed the Electrical Code requirements. Conduit shall be securely fastened within 3 feet of each outlet box, junction box, device box, cabinet, or fitting.

J. Supports of flexible conduit shall be within 12 inches of each outlet box, junction box, device box, cabinet, or fitting and at intervals not to exceed 4.5 feet.

K. Supports for non-metallic conduit shall be at sufficiently close intervals to eliminate any sag in the conduit. The manufacturer's recommendations shall be followed, but in no event shall support spans exceed the Electrical Code requirements.

L. Where conduit is to be installed in poured concrete floors or walls, provide concrete-tight conduit inserts securely fastened to forms to prevent conduit misplacement.

M. Finish:

1. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and above suspended ceiling spaces are not considered exposed.

2. Trim all ends of exposed field fabricated steel hangers, slotted channel and threaded rod to within 1" of support or fastener to eliminate potential injury to personnel unless shown otherwise on the drawings. Smooth ends and install elastomeric insulation with two coats of latex paint if exposed steel is within 6'-6" of finish floor and presents potential injury to personnel.

3.4 CONDUIT INSTALLATION

A. Conduit Connections:

1. Shorter than standard conduit lengths shall be cut square using industry standards. The ends of all conduits cut shall be reamed or otherwise finished to remove all rough edges.
2. Metallic conduit connections in slab on grade installation shall be sealed and one coat of rust inhibitor primer applied after the connection is made.
3. Where conduits with tapered threads cannot be coupled with standard couplings, then approved split or Erickson couplings shall be used. Running threads will not be permitted.
4. Install expansion/deflection joints where conduit crosses structure expansion/seismic joints.

B. Conduit terminations for all low voltage wiring shall have nylon bushings installed on each end of every conduit run.

C. Conduit Bends:

1. Use a hydraulic one-shot conduit bender or factory elbows for bends in conduit 2" in size or larger. All steel conduit bending shall be done cold; no heating of steel conduit shall be permitted.
2. All bends of rigid polyvinyl chloride conduit (PVC) shall be made with the manufacturer's approved bending equipment. The use of spot heating devices will not be permitted (i.e. blow torches).
3. A run of conduit shall not contain more than the equivalent of four (4) quarter bends (360°), including those bends located immediately at the outlet or body.
4. Telecommunications conduits shall have no more than two (2) 90-degree bends between pull points and contain no continuous sections longer than 100 feet. Insert pull points or pull boxes for conduits exceeding 100 feet in length.

    a. A third bend is acceptable if:

        1) The total run is not longer than (33) feet.
        2) The conduit size is increased to the next trade size.

5. Telecommunications pull boxes shall not be used in lieu of a bend. Align conduits that enter the pull box from opposite ends with each other. Pull box size shall be twelve (12) times the diameter of the largest conduit. Slip sleeves or gutters can be used in place of a pull box.

6. Telecommunications Conduit(s): Maintain appropriate conduit bend radius at all times. For conduits with an internal diameter of less than 2", maintain a bend radius of at least 6 times the internal diameter. For conduits with an internal diameter 2" or greater, maintain a bend radius of at least 10 times the internal diameter.
7. Rigid polyvinyl chloride conduit (PVC) runs longer than 100 feet or runs which have more than two 90° equivalent bends (regardless of length) shall use rigid metal or RTRC factory elbows for bends.
8. Use conduit bodies to make sharp changes in direction (i.e. around beams).

D. Conduit Placement:

1. Conduit shall be mechanically continuous from source of current to all outlets. Conduit shall be electrically continuous from source of current to all outlets, unless a properly sized grounding conductor is routed within the conduit. All metallic conduits shall be bonded per the Electrical Code.
2. Route exposed conduit and conduit above suspended ceilings (accessible or not) parallel/perpendicular to the building structural lines, and as close to building structure as possible. Wherever possible, route horizontal conduit runs above water and steam piping.
3. Route conduit through roof openings provided for piping and ductwork where possible. If not provided or routing through provided openings is not possible, route through roof jack with pitch pocket. Coordinate roof penetrations with other trades.
4. Conduits, raceway, and boxes shall not be installed in concealed locations in metal deck roofing or less than 1.5" below bottom of roof decking.
5. Avoid moisture traps where possible. Where unavoidable, provide a junction box with drain fitting at conduit low point.
6. All conduits through walls shall be grouted or sealed into openings. Where conduit penetrates firewalls and floors, seal with a UL listed sealant. ; **refer to Section 26 05 03 for through penetration firestopping requirements**.
7. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OPENINGS REQUIRED IN MASONRY OR EXTERIOR WALLS UNDER THIS DIVISION. A QUALIFIED MASON AT THE EXPENSE OF THIS CONTRACTOR SHALL REPAIR ALL OPENINGS TO MATCH EXISTING CONDITIONS.
8. Seal interior of conduit at exterior entries, air handling units, coolers/freezers, etc., and where the temperature differential can potentially be greater than 20°F, to prevent moisture penetration. Seal shall be placed where conduit enters warm space. Conduit seal fitting shall be a drain/seal, with sealing compound, identified for use with cable and raceway system, equal to O-Z/Gedney type EYD.
9. Horizontal conduit routing through slabs above grade:

    a. Conduits, if run in concrete structure, shall be in middle one-third of slab thickness, and leave at least 3" min. concrete cover. Conduits shall run parallel to each other and spaced at least 8" apart centerline to centerline. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement. Maximum conduit outside diameter 1".

10. Do not route conduits across each other in slabs on grade.
11. Rigid polyvinyl chloride conduit (PVC) shall be installed when material surface temperatures and ambient temperature are greater than 40°F.

12. Where rigid polyvinyl chloride conduit (PVC) is used below grade, in a slab, below a slab, etc., a transition to rigid galvanized steel or PVC-coated steel conduit shall be installed before conduit exits earth. The metallic conduit shall extend a minimum of 6" into the surface concealing the non-metallic conduit.
13. Contractor shall provide suitable mechanical protection around all conduits stubbed out from floors, walls or ceilings during construction to prevent bending or damaging of stubs due to carelessness with construction equipment.
14. Contractor shall provide a polypropylene pull cord with 2000 lbs. tensile strength in each empty conduit (indoor and outdoor), except in sleeves and nipples.
15. Telecommunications conduits that protrude through the structural floor shall be installed 1 to 3" above finished floor (AFF).
16. Telecommunications conduits that enter into Telecommunications rooms below the finished ceiling shall terminate a minimum of 4" below ceiling and as close to the wall as possible.
17. Telecommunications conduits that are below grade and enter into a building shall terminate a minimum of 4" above finished floor (AFF) and as close to the wall as possible.

3.5 CONDUIT TERMINATIONS

A. Where conduit bonding is indicated or required in the contract documents, the bushings shall be a grounding type sized for the conduit and ground bonding conductor as manufactured by O-Z/Gedney, Appleton, Thomas & Betts, Burndy, Regal, Orbit Industries or approved equal.

B. Conduits with termination fittings shall be threaded for one (1) lock nut on the outside and one (1) lock nut and bushing on the inside of each box.

C. Where conduits terminate in boxes with knockouts, they shall be secured to the boxes with lock nuts and provided with approved screw type tinned iron bushings or fittings with plastic inserts.

D. Where conduits terminate in boxes, fittings, or bodies with threaded openings, they shall be tightly screwed against the shoulder portion of the threaded openings.

E. Conduit terminations to all motors shall be made with flexible metallic conduit (FMC), unless noted otherwise. Final connections to roof exhaust fans, or other exterior motors and motors in damp or wet locations shall be made with liquidtight flexible metallic conduit (LFMC). Motors in hazardous areas, as defined in the Electrical Code, shall be connected using flexible conduit rated for the environment. Flexible conduit shall not exceed 6' in length. Route equipment ground conductors from circuit ground to motor ground terminal through flexible conduit.

F. Rigid polyvinyl chloride conduit (PVC) shall be terminated using fittings and bodies produced by the manufacturer of the conduit, unless noted otherwise. Prepare conduit as per manufacturer's recommendations before joining. All joints shall be solvent welded by applying full even coat of plastic cement to the entire areas that will be joined. Turn the conduit at least a quarter to one half turn in the fitting and let the joint cure for 1-hour minimum or as per the manufacturer's recommendations.

G. All conduit ends shall be sealed with plastic immediately after installation to prevent the entrance of any foreign matter during construction. The seals shall be removed and the conduits blown clear of all foreign matter prior to any wires or pull cords being installed.

3.6 UNDERGROUND CONDUIT INSTALLATION

A. Conduit Connections:

1. Conduit joints in a multiple conduit run shall be staggered at least one foot apart.

B. Conduit Bends (Lateral):

1. Conduits shall have long sweep radius elbows instead of standard elbows wherever special bends are indicated and noted on the drawings, or as required by the manufacturer of the equipment or system being served.
2. Telecommunications conduit bend radius shall be six times the diameter for conduits under 2" and ten times the diameter for conduits over 2". Where long cable runs are involved, sidewall pressures may require larger radius bends. Coordinate with Architect/Engineer prior to conduit installation to determine bend radius.

C. Conduit Elbows (vertical):

1. Minimum metal or RTRC elbow radiuses shall be 30 inches for primary conduits (greater than 600V) and 18 inches for secondary conduits (less than 600V). Increase radius, as required, based on pulling tension calculation requirements.

D. Conduit Placement:

1. Conduit runs shall be pitched a minimum of 4" per 100 feet to drain toward the terminations. Duct runs shall be installed deeper than the minimum wherever required to avoid any conflicts with existing or new piping, tunnels, etc.
2. For parallel runs, use suitable separators and chairs installed not greater than 4' on centers. Band conduit together with suitable banding devices. Securely anchor conduit to prevent movement during concrete placement or backfilling.
3. Where concrete is required, the materials for concreting shall be thoroughly mixed to a minimum f'c = 2500 and immediately placed in the trench around the conduits. No concrete that has been allowed to partially set shall be used.
4. Before the Contractor pulls any cables into the conduit, Contractor shall have a mandrel 1/4" smaller than the conduit inside diameter pulled through each conduit and if any concrete or obstructions are found, the Contractor shall remove them and clear the conduit. Spare conduit shall also be cleared of all obstructions.
5. Conduit terminations in manholes, masonry pull boxes, or masonry walls shall be with malleable iron end bell fittings.
6. All spare conduits not terminated in a covered enclosure shall have its terminations plugged as described above.
7. Ductbanks and conduit shall be installed a minimum of 24" below finished grade, unless otherwise noted on the drawings or elsewhere in these specifications.
8. All non-metallic conduit installed underground outside of a slab shall be rigid.

E. Horizontal Directional Drilling:

1. Entire drill path shall be accurately surveyed, with entry and exit stakes placed and coordinated with other contractors. If using a magnetic guidance system, entire drill path shall be surveyed for any surface geo-magnetic variations or anomalies.
2. Any utility locates within 20 feet of the bore path shall have the exact location physically verified by hand digging or vacuum excavation. Restore inspection holes to original condition after verification.

F. Raceway Seal:

1. Where a raceway enters a building or structure, it shall be sealed with a sealing bushing or duct seal to prevent the entry of liquids or gases. Seal must be compatible with conductors and raceway system. Spare or unused raceway shall also be sealed.
2. All telecommunications conduits and innerducts, including those containing cables, shall be plugged at the building and vault with "JackMoon" or equivalent duct seal, capable of withstanding a 10-foot head of water (5 PSI).

3.7 BOX INSTALLATION SCHEDULE

A. Galvanized steel boxes may be used in:

1. Concealed interior locations above ceilings and in hollow studded partitions.
2. Exposed interior locations in mechanical rooms and in rooms without ceilings; higher than 8' above the highest platform level.
3. Direct contact with concrete except slab on grade.
4. Recessed in stud wall of kitchens and laundries.

B. Cast boxes shall be used in:

1. Exterior locations.
2. Hazardous locations.
3. Exposed interior locations within 8' of the highest platform level.
4. Direct contact with earth.
5. Direct contact with concrete in slab on grade.
6. Wet locations.
7. Kitchens and laundries when exposed on wall surface.

3.8 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as shown on the drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

B. Electrical box locations shown on the Contract Drawings are approximate, unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.

C. Locate and install boxes to allow access. Avoid interferences with ductwork, piping, structure, equipment, etc. Recessed luminaires shall not be used as access to outlet, pull, and junction boxes. Where installation is inaccessible, provide access doors. Coordinate locations and sizes of required access doors with the Architect/Engineer and General Contractor.

D. Locate and install to maintain headroom and to present a neat appearance.

E. Coordinate locations with Heating Contractor to avoid baseboard radiation cabinets.

3.9 OUTLET BOX INSTALLATION

A. Do not install boxes back-to-back in walls.

1. Provide a minimum horizontal separation of 6 inches between boxes installed on opposite sides of non-rated stud walls. When the minimum separation cannot be maintained, install sound insulation pads on all five sides of the back box in accordance with the manufacturer's instructions.
2. Provide a minimum horizontal separation of 24 inches between boxes installed on opposite sides of fire-rated walls. When the minimum separation cannot be maintained, the box is greater than 16 square inches or the total box area (all trades) per 100 square feet is greater than or equal to 100 square inches, install fire-rated moldable pads to all five sides of the back box to maintain the fire rating of the wall. Install moldable pads in accordance with UL listing for the specific product. Sound insulation pads are not acceptable for use in fire-rated wall applications unless the product carries the necessary fire rating.

B. Install sound insulation pads on all five sides of the back of all boxes in sound-rated wall assemblies. Sound-rated wall assemblies are defined as partition types carrying a Sound Transmission Class (STC) rating.

C. The Contractor shall anchor switch and outlet box to wall construction so that it is flush with the finished masonry, paneling, drywall, plaster, etc. The Contractor shall check the boxes as the finish wall surface is being installed to assure that the box is flush. (Provide plaster rings as necessary.)

D. Mount at heights shown or noted on the drawings or as generally accepted if not specifically noted.

E. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.

F. Provide knockout closures for unused openings.

G. Support boxes independently of conduit.

H. Use multiple-gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

I. Install boxes in walls without damaging wall insulation.

J. Coordinate mounting heights and locations of outlets mounted above counters, benches, backsplashes, and below baseboard radiation.

K. Position outlets to locate luminaires as shown on reflected ceiling drawings.

L. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioned to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

M. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

N. Provide cast outlet boxes in exterior locations and wet locations, and where exposed rigid or intermediate conduit is used.

3.10 PULL AND JUNCTION BOX INSTALLATION

A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.

B. Support pull and junction boxes independent of conduit.

C. Do not install boxes back-to-back in walls.

1. Provide a minimum horizontal separation of 6 inches between boxes installed on opposite sides of non-rated stud walls. When the minimum separation cannot be maintained, install sound insulation pads on all five sides of the back box in accordance with the manufacturer's instructions.
2. Provide a minimum horizontal separation of 24 inches between boxes installed on opposite sides of fire-rated walls. When the minimum separation cannot be maintained, the box is greater than 16 square inches or the total box area (all trades) per 100 square feet is greater than or equal to 100 square inches, install fire-rated moldable pads to all five sides of the back box to maintain the fire rating of the wall. Install moldable pads in accordance with UL listing for the specific product. Sound insulation pads are not acceptable for use in fire-rated wall applications unless the product carries the necessary fire rating.

D. Install sound insulation pads on all five sides of the back of all boxes in sound-rated wall assemblies. Sound-rated wall assemblies are defined as partition types carrying a Sound Transmission Class (STC) rating.

3.11 EXPOSED BOX INSTALLATION

A. Boxes shall be secured to the building structure with proper size screws, bolts, hanger rods, or structural steel elements.

B. On brick, block and concrete walls or ceilings, exposed boxes shall be supported with no less than two (2) Ackerman-Johnson, Paine, Phillips, or approved equal screw anchors or expansion shields and round head machine screws. Cast boxes shall not be drilled.

C. On steel structures, exposed boxes shall be supported to the steel member by drilling and tapping the member and fastening the boxes by means of round head machine screws.

D. Boxes may be supported on steel members by APPROVED beam clamps if conduit is supported by beam clamps.

E. Boxes shall be fastened to wood structures by means of a minimum of two (2) wood screws adequately large and long to properly support. (Quantity depends on size of box.)

F. Wood, plastic, or fiber plugs shall not be used for fastenings.

G. Explosive devices shall not be used unless specifically allowed.

END OF SECTION 26 05 33

SECTION 26 05 48 - SEISMIC REQUIREMENTS FOR EQUIPMENT AND SUPPORTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Seismic Requirements.

1.2 QUALITY ASSURANCE

A. General:

1. The contractor shall retain a specialty consultant or equipment manufacturer to develop a seismic restraint and support system and perform seismic calculations in accordance with these specifications, state, and local codes.
2. Items used for seismic restraint of equipment and systems shall be specifically manufactured for seismic restraint.
3. These requirements are beyond those listed in Section 26 05 27 of these specifications. Where a conflict arises between the seismic requirements of this section and any other section, the Architect/Engineer shall be immediately notified for direction to proceed.

B. Manufacturer:

1. System Supports/Restraints: Company specializing in the manufacture of products specified in this Section.
2. Equipment: Each company providing equipment that must meet seismic requirements shall provide certification included in project submittals the equipment supplied for the project meets or exceeds the seismic requirements of the project.

C. Testing Agency: An independent testing agency, acceptable to Authorities Having Jurisdiction, with experience and capability to conduct the testing indicated.

D. Installer: Company specializing in performing the work of this Section.

1.3 REFERENCES

A. International Building Code, 2012.

B. ASHRAE - A Practical Guide to Seismic Restraint.

C. ASCE 7-10, Chapter 13.

1.4 SUBMITTALS

A. Submit under provisions of Section 26 05 00.

B. Submittal to Code Official:

1. Contractor shall submit copies of the seismic shop drawings to the governing code authority for approval.

C. Shop Drawings:

1. Calculations, restraint selections, and installation details shall be designed and sealed by a Professional Structural Engineer licensed in the state where the project is located experienced in seismic restraint design and installation.
2. Manufacturer's Certifications: Professional Structural Engineer licensed in the state where the project is located shall review and approve manufacturer's certifications of compliance.
3. Equipment - Submit for each piece of equipment supplied:

a. Certification that the equipment supplied for the project meets or exceeds the seismic requirements specified. Equipment certification is to be provided by the manufacturer.

1.5 TESTING AND INSPECTION

A. Special Inspection and Testing shall be done in accordance with Chapter 17 of the International Building Code.

B. The Contractor shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704 and 1705.

C. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected. The fabricator shall submit a certificate of compliance that the work has been performed in accordance with the approved plans and specifications to the building official and the Architect and Engineer of Record.

D. The Special Inspection Agency shall furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The reports shall be completed and furnished within 48 hours of inspected work. A final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency's knowledge, in conformance with the approved plans and specifications shall be submitted.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site. Accept material on site in factory containers and packing. Inspect for damage. Protect from damage and contamination by maintaining factory packaging until installation. Follow manufacturer's instructions for storage.

1.7 DESIGN REQUIREMENTS

A. This project is subject to the seismic bracing requirements of the International Building Code, 2012 edition.

B. The following criteria are applicable to this project:

1. Risk Category: IV
2. Seismic Importance Factor: I_E = 1.5
3. Seismic Design Category: D
4. Component Amplification Factors (ap) and Component Response Modification Factors (Rp) shall be taken from Table 13.5-1 in ASCE 7-10 for the individual equipment or system being restrained.
5. Component Importance Factors (Ip) shall be taken from Section 13.1.3 in ASCE 7-10 for the individual equipment or system being restrained.
6. The total height of the structure and the height of the system to be restrained within the structure shall be determined in coordination with architectural plans and the General Contractor.

C. Forces shall be calculated with the above requirements and Equation 13.3-1, -2, and -3 of ASCE 7-10, unless exempted by 13.1.4.

D. Equipment shall meet International Building Code and ASCE 7 seismic qualification requirements in concurrence with ICC ES AC156 Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems.

1.8 COORDINATION

A. Coordinate layout and installation of seismic bracing with building structural systems and architectural features, and with mechanical, fire-protection, electrical and other building features in the vicinity.

1.9 WARRANTY

A. Provide one-year warranty on parts and labor for manufacturer defects and installation workmanship.

PART 2 - PRODUCTS

2.1 SUPPLIERS

A. Following is a partial list of manufacturer/supplier contact information for seismic restraints:

1. B-Line Systems, Inc. (800) 851-7415, www.b-line.com.
2. Unistrut Corporation http://www.unistrut.us/
3. Kinetics Noise Control (877) 457-2695, www.kineticsnoise.com.
4. Mason Industries, Inc. www.mason-ind.com.
5. Loos & Co., Inc. (800) 321-5667, www.loosnaples.com.
6. Tolco (909) 737-5599, www.tolco.com
7. ISAT 877.523.6060, www.isatsb.com
8. Vibro-Acoustics (416) 291-7371, https://virs.vibro-acoustics.com/

2.2 SEISMIC DESIGN CRITERIA

A. This section describes the requirements for seismic restraint of systems and equipment related to continued operation of the facility after a design seismic event.

B. Definitions:

1. Stay in Place:

a. All systems and equipment shall be anchored and restrained such that the anchoring system is intended not to fail and equipment and/or system components will not fall.

2. Remain Operational:

a. Requirements for "Stay in Place" listed above shall be met.
b. The following systems and associated equipment are intended not to fail externally or internally and are intended to continue operation following a seismic event:

1) Life Safety Power
2) Emergency Power System
3) Fire Alarm

2.3 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

A. General:

1. Seismic restraint designer shall coordinate all attachments with the Structural Engineer of Record; refer to submittal requirements.
2. The seismic restraint design shall be based on actual equipment data obtained from manufacturer's submittals or the manufacturer. The equipment manufacturer shall verify and provide written certification the attachment points on the equipment can accept the combination of seismic, weight, and other imposed loads.
3. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
4. Analysis shall detail anchoring methods, bolt diameter, embedment, and weld length.
5. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code.

B. Housekeeping Pads:

1. Reinforced housekeeping pads shall be provided to handle shear, tension, and compression forces with proper reinforcement, doweling, and attachments connecting the pad to the structural slab.

2.4 SEISMIC RESTRAINT AND CONSTRUCTION OF EQUIPMENT

A. Equipment supplied for the project shall be designed to meet the requirements of lateral forces calculated using the applicable code and method described above.

B. The following is a partial list of equipment that shall be restrained and that shall be constructed to meet seismic forces described in this section:
1. Panelboards Emergency Feeders
2. Disconnect Switches
3. Magnetic, Manual, Combination Starters
4. Variable Frequency Drives
5. Automatic/Manual Transfer Switches
6. Interior Luminaires
7. Emergency Luminaires and Exit Signs
8. Emergency Power Supply
9. Engine Generator Systems
10. Fire Alarm Panel, Initiating and Notification Appliances
11. Security System

2.5 MATERIALS

A. Use the following materials for restraints:

1. Indoor Dry Locations: Steel, zinc plated.
2. Outdoors and Damp Locations: Galvanized steel.

2.6 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

A. Strength: Defined in reports by ICC Evaluation Service or another agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.

B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type. Comply with IBC, ACI and ICC ES requirements for cracked concrete anchors.

C. Concrete Inserts: Steel-channel type.

D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM F3125, Grade A 325.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.

2.7 SEISMIC BRACING COMPONENTS

A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inchthick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.

1. Materials for Channel: ASTM A 1011, GR 33.
2. Materials for Fittings and Accessories: ASTM A 635, ASTM A 576, or ASTM A 36.
3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.
4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.

B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to the applicable code sections and Authority Having Jurisdiction for the exact seismic restraint requirements of conduit, equipment, etc.

B. Layout of transverse and longitudinal bracing shall follow recommendations of approved design standards listed in Part 1 of this specification section.

C. All rigid floor mounted equipment shall have a resilient media between the equipment mounting hole and the anchor bolt in concrete.

D. All seismic restraint systems shall be installed in strict accordance with the manufacturer's written instructions and all certified submittal data.

E. Installation of seismic restraints shall not cause any change in position of equipment lighting or conduits resulting in stresses or misalignment.

F. No rigid connections between equipment and the building structure shall be made that degrade the noise and vibration-isolation system specified.

G. Do not install any equipment or conduit that makes rigid connections with the building unless isolation is not specified.

H. Coordinate work with all other trades to avoid rigid contact with the building. Any conflicts with other trades that will result in rigid contact with equipment or conduit due to inadequate space or other unforeseen conditions shall be brought to the Architect/Engineer's attention prior to specific equipment selection.

I. Prior to installation, bring to the Architect/Engineer's attention any discrepancies between the specifications and the field conditions, or changes required due to specific equipment selection.

J. Bracing may occur from flanges of structural beams, upper truss cords of bar joists, cast in place inserts, or International Code Council approved seismic anchors for installation in concrete.

K. Cable restraints shall be installed slightly slack to avoid short-circuiting the isolated suspended equipment or conduit.

L. Cable assemblies shall be installed taut on non-isolated systems. Solid braces may be used in place of cables on rigidly attached systems only.

M. Do not install cables over sharp corners.

N. Brace support rods when necessary to accept compressive loads. Welding of compression braces to the vertical support rods is not acceptable.

O. Provide reinforced clevis bolts when required.

P. The vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not acceptable.

Q. Post-Installed anchors shall be provided to meet seismic requirements.

R. Vertical conduit risers flexibly supported to accommodate thermal motion and/or conduit vibration shall be guided to maintain conduit stability and provide horizontal seismic restraint.

S. Seismic restraints shall be mechanically attached to the system. Looping restraints around the system is not acceptable.

T. Conduit crossing building seismic or expansion joints, passing from building to building, or supported from different portions of the building shall be installed to allow differential support displacements without damaging the conduit, equipment connections, or support connections. Conduit offsets, loops, anchors, and guides shall be installed as required to provide required motion capability and limit motion of adjacent conduit.

U. Do not brace a system to two different structures such as a wall and a ceiling.

V. Provide appropriately sized openings in walls, floors, and ceilings for anticipated seismic movement. Provide fire seal systems in fire-rated walls.

W. Positively attach all roof-mounted equipment to roof curbs. Positively attach all roof curbs to building structure.

X. Exposed seismic supports in occupied areas shall be guarded or covered to protect occupants.

3.2 SEISMIC RESTRAINT EXCLUSIONS

A. Refer to the applicable code sections and Authority Having Jurisdiction for allowable exclusions.

END OF SECTION 26 05 48

SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Adhesive Markings and Field Labels

B. Nameplates and Signs

C. Product Colors

1.2 REFERENCES

A. NFPA 70E - National Electrical Safety Code

B. NFPA 70 - National Electrical Code (NEC)

C. ANSI A13.1 - Standard for Pipe Identification

D. ANSI Z535.4 - Standard for Product Safety Signs and Labels

1.3 QUALITY ASSURANCE

A. Electrical identification products shall be suitable for the environment installed. Identification labels damaged by the environment due to ultraviolet light fading, damp or wet conditions, physical damage, corrosion, or other conditions shall be replaced with labels suitable for the environment.

PART 2 - PRODUCTS

2.1 ADHESIVE MARKINGS AND FIELD LABELS

A. Adhesive Marking Labels for Raceway: Pre-printed, flexible, self-adhesive vinyl labels with legend indicating voltage and service (Emergency, Lighting, Power, HVAC, Communications, Control, Fire).

1. Label Size as follows:

a. Raceways: Kroy or Brother labels 1-inch high by 12-inches long (minimum).

2. Color: As specified for various systems.

B. Colored Adhesive Marking Tape for banding Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.

C. Pretensioned Flexible Wraparound Colored Plastic Sleeves for Cable Identification: flexible acrylic bands sized to suit the cable diameter and arranged to stay in place by pre-tensioned gripping action when coiled around the cable.

D. Wire/Cable Designation Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with preprinted numbers and letter.

E. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from -40°F to 185°F (-40°C to 85°C), type 2/2S or type 21/21S based on application. Provide ties in specified colors when used for color coding. Cable ties shall be listed and identified for the application, securement, and support.

F. Underground Plastic Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inches wide by 4 mil thick, printed legend indicating type of underground line, manufactured for direct burial service. Tape shall contain a continuous metallic wire to allow location with a metal detector.

G. Aluminum, Wraparound Marker Bands: 1-inch width, 0.014 (5mm) inch thick aluminum bands with stamped or embossed legend and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.

H. Brass or Aluminum Tags: 2" (50mm) by 2" (50mm) by .05-inch metal tags with stamped legend, punched for fastener.

I. Indoor/Outdoor Number and Letters: Outdoor grade vinyl label with acrylic adhesive designed for permanent application in severe indoor and outdoor environments.

J. Text Sizes:

1. The following information shall be used for text heights, fonts, and size, unless otherwise noted.

    a. Font: Normal 721 Swiss Bold
    b. Adhesive Labels: 3/16 inch minimum text height
    c. Vinyl / Plastic Laminate Labels: 3/4" inch minimum text height

2.2 NAMEPLATES AND SIGNS

A. Engraved, Plastic-Laminated Labels, Signs and Instruction Plates: Engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8 inch thick for larger sizes. Labels shall be punched for mechanical fasteners.

B. Text Sizes:

1. The following information shall be used for text heights, fonts, and size, unless otherwise noted.

    a. Text Height: 3/8 inch minimum

C. Baked-Enamel Signs for interior Use: Preprinted aluminum signs, punched, or drilled for fasteners, with colors, legend, and size required for application. Mounting ¼" grommets in corners.

D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396 inch galvanized-steel backing: and with colors, legend, and size required for application. Mounting 1/4" grommets in corners.

E. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

F. Fasteners for Plastic-Laminated Signs; Self-tapping stainless steel screws or number 10/32 stainless steel machine screws with nuts and flat and lock washers.

2.3 PRODUCT COLORS

A. Adhesive Markings and Field Labels:

1. All Labels: Black letters on white face
2. Normal Power and General Labels: Black letters on white face
3. Control Labels: Black letters on white face
4. Fire Alarm: Red letters on white face
5. Emergency: Red letters on white face

B. Nameplates and Signs:

1. NORMAL POWER: Black letters on white face
2. Control Labels: Black letters on white face
3. EMERGENCY: White letters on red face
4. GROUNDING: White letters on green face.
5. CAUTION or UPS: Black letters on yellow face

C. Raceways and Conduit:

1. Provide color coded conduit as indicated below. Conduit shall be colored by the manufacturer:

    a. Normal Power and General Distribution: Silver
    b. Emergency Power Distribution System:

        1) All Emergency: Orange

    c. Fire Alarm System: Red
    d. Temperature Controls: Refer to mechanical cover sheet for color
    e. Ground: Green
    f. Low Voltage and Telephone: Purple
    g. Clock, Sound, Security System, and Intercom: Black

D. Conductor Color Identification: Refer to Part 3 for additional information.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by code.

B. Exposed Ceilings and Finished Spaces: The project includes exposed ceilings in finished spaces. The installation of colored raceways and labeling may not be aesthetically desirable in finished spaces. The contractor shall coordinate identification requirements in exposed ceilings of finished spaces with the A/E prior to installation and ordering of materials.

C. Electrical System Color Chart: This Contractor shall furnish and install framed 8" x 12" charts of the color-coded identification scheme used for the electrical system in all electrical rooms and next to the main fire alarm panel.

D. Install identification devices in accordance with manufacturer's written instruction and requirements of Electrical Code.

E. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work. All mounting surfaces shall be cleaned and degreased prior to identification installation.

F. Circuit Identification: Tag or label conductors as follows:

1. Multiple Power or Lighting Circuits in Same Enclosure: Where multiple branch circuits are terminated or spliced in a box or enclosure, label each conductor with source and circuit number.
2. Multiple Control Wiring and Communication/Signal Circuits in Same Enclosure: For control and communications/signal wiring, use wire/cable marking tape at terminations in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tape.
3. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.

G. Apply Danger, Warning, Caution and instruction signs as follows:

1. Install Danger, Warning, Caution or instruction signs where required by Electrical Code, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
2. 'Danger' indicates a hazardous situation which, if not avoided, will result in death or serious injury. ANSI standard red background, white letters.
3. 'Warning' indicates a hazardous situation which, if not avoided, could result in death or serious injury. ANSI standard orange background, black letters.

4. 'Caution' indicates a hazardous situation which, if not avoided, may result in minor or moderate injury. ANSI standard yellow background, black letters.
5. Emergency Operating Signs: Install, where required by Electrical Code, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect, engraved laminate signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.

H. Apply circuit/control/item designation labels of engraved plastic laminate for pushbuttons, pilot lights, alarm/signal components, and similar items, except where labeling is specified elsewhere.

I. Install labels parallel to equipment lines at locations as required and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

J. Install ARC FLASH WARNING signs on all power distribution equipment per Section 26 05 73.

K. Selective Coordination Label: Install caution signs on all panelboards, disconnects, and other equipment with selectively coordinated overcurrent protection devices. Sign at a minimum shall contain:

1. CAUTION: OVERCURRENT DEVICES IN THIS ENCLOSURE ARE SELECTIVELY COORDINATED. EQUIVALENT REPLACEMENTS AND TRIP SETTINGS ARE REQUIRED.

L. Underground Electrical Lines: For exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 (150mm) to 8 (205mm) inches below grade. A single plastic line marker is permitted when the width of the common trench does not exceed 16 inches; provide a second plastic line marker to mark each edge of the trench when 16 inches of width is exceeded. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

3.2 FEEDER AND BRANCH CIRCUIT DIRECTORIES

A. Product:

1. Adhesive labels and field markings
2. Nameplates and signs

B. Feeder Directories Branch: Provide each feeder, branch circuit, feeder modification, and branch circuit modification with a typed circuit directory label. Refer to technical equipment specification sections for additional requirements. Include the following with each label:

1. Load Description: Lighting, receptacles, specific equipment, spare, space, or similar description.
2. Location: Room name, number, location.

3. Contacts: Provide a label of the contractors company with contact name and phone number(s) for emergency contact.
4. Circuit: Provide a label that contains where the feeder for this device originates, including circuit number.

C. Provide a factory or custom clear plastic sleeve for each branch panel directory and secure to inside panel cover.

3.3 LIGHTING CONTROL AND RECEPTACLE COVER PLATES

A. Product:

1. Adhesive labels and field markings
2. Nameplates and signs

B. Identification material to be a clear, 3/8-inch Kroy tape or Brother self-laminating vinyl label with black letters. Embossed Dymo-Tape labels are not acceptable. Permanently affix identification label to cover plates, centered above the receptacle openings.

C. Provide identification on all switch and receptacle cover plates. Identification shall indicate source and circuit number serving the device (e.g. "C1A #24"). Identification for switch cover plates shall be installed on the inside cover.

3.4 CONDUIT AND EXPOSED CABLE LABELING

A. Product:

1. Adhesive labels and field markings

B. Conduit Identification: Pre-printed, flexible, self-adhesive vinyl labels with legend at 25 foot (7.5 meter) intervals to identify all conduits run exposed or located above accessible ceilings. Conduits located above non-accessible ceiling or in floors and walls shall be labeled within 3 feet of becoming accessible, or separated by enclosures, walls, partitions, ceilings, and floors. Labels for multiple conduits shall be aligned. Refer to color requirements in Part 2 when applicable in addition to the following:

1. 1000 Volt or less Normal/Emergency Power: Indicate feeder identification and voltage.
2. Fire Alarm: Indicate "FIRE ALARM".
3. Grounding: Indicate "GROUND" and equipment and designation.
4. Security System: Indicate "Security".
5. Telephone System: Indicate "Telephone".

C. Blank conduit ends or outlet boxes for future extension of system shall have permanent identification marker indicating purpose of conduit or box and where the raceway originated.

3.5 CONDUIT AND RACEWAY COLOR BANDING FOR EXISTING CONDITIONS AND REMODELING

A. Existing Conduit and Raceways: Identify existing conduits and raceways within the limits of the project boundary with color banding.

1. Existing conduit and raceways to be color banded: 3/4 inch and larger.
2. The Contractor shall perform a review of the existing conduit, raceway, and system type prior to submitting a bid. The Contractor's review shall include a review of areas with non-finished ceilings and areas with accessible finished ceilings.

B. New Conduit and Raceways: Identify new conduits and raceways with color banding. The following products and materials shall be identified with color banding when required by Part 1 of this specification.

1. Rigid metallic conduit and fittings (RMC)
2. Intermediate metallic conduit and fittings (IMC)

C. Instructions:

1. Band exposed or accessible raceways, cables, and bare conductors of the. Bands shall be pretensioned, snap-around colored plastic sleeves, colored adhesive marking tape, or a combination of the two. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side. Refer to Part 1 of this specification for specific systems and colors requiring banding.
2. Install bands at changes within 36 inches of direction changes, all wall/floor penetrations, at each junction box, and at 10-foot maximum intervals in straight runs.

3.6 BOX LABELING

A. Products:

1. Adhesive labels and field markings

B. Identify Junction, Pull and Connection Boxes: Labeling shall be 3/8-inch Kroy tape OR Brother self-laminating vinyl label, letters/numbers color coded same as conduits.

C. All junction, pull, and connection boxes shall be identified as follows:

1. For power and lighting circuits, indicate system voltage and identity of contained circuits ("120V, 1LA1-3,5,7").
2. For other wiring, indicate system type and description of wiring ("FIRE ALARM NAC #1").

3.7 CONDUCTOR COLOR CODING

A. Products:

1. All wire and cables shall be color coded by the manufacturer.
2. All wires and cables, 6 AWG or larger, used in motor circuits, main feeders, sub-main feeders, and branch circuits shall be coded by the application of plastic tape. The tape shall be 3-M, Plymouth or Permacel in colors specified below. The tape shall be applied at each conductor termination with two 1-inch tape bands at 6-inch centers. Contractor option to use colored cabling in lieu of the tape at each end for conductor 6 AWG to 500 KCM. Wire and cables smaller than 6 AWG shall be color coded by the manufacturer.

B. Color coding shall be applied at all panels, switches, junction boxes, pull boxes, vaults, manholes etc., where the wires and cables are visible and terminations are made. The same color coding shall be used throughout the entire electrical system, therefore maintaining proper phasing throughout the entire project.

C. Colored cable ties shall be applied in groups of three ties of specified color to each conductor at each terminal or splice point starting 3 inches from the termination and spaced at 3- inches centers. Tighten to a snug fit and cut off excess length.

D. Where more than one nominal voltage system exists in a building or facility, each ungrounded conductor of a multi-wire branch circuit, where accessible, shall be identified by phase and system.

E. Conductors shall be color coded as follows:

1. 208Y/120 Volt, 4-Wire:

a. A-Phase - Black
b. B-Phase - Red
c. C-Phase - Blue
d. Neutral - White
e. Ground Bond - Green

2. Grounding Conductors:

a. Equipment grounding conductors, main/system/supply-side bonding jumpers: Green.

3. Cabling for Remote Control, Signal, and Power Limited Circuits:

a. Fire Alarm: Red.
b. Low Voltage Switching: Per manufacturer recommendations and code requirements.
c. Building Automation Systems and Control: Refer to the Temperature Control Contactor notes located on the mechanical cover sheet.
d. Electronic Control: Per manufacturer recommendations and code requirements.
e. Audio/Visual Systems: Refer to Division 27.
f. Structured Cabling: Refer to Division 27.

3.8 CONTROL EQUIPMENT IDENTIFICATION

A. Products:

1. Nameplates and signs

B. Provide identification on the front of all control equipment such as combination starters, starters, VFDs, contactors, motor control centers, etc.

C. Labeling shall include:

1. Equipment type being served.
2. Location of equipment being served if it is not located within sight.
3. Voltage and phase of circuit(s).
4. Panel and circuit number(s) serving the equipment.
5. Method of automatic control, if included ("AUTO CONTROL BY FMCS").
6. Available fault current; refer to one-line diagram or panel schedule of panel serving equipment.
7. Date of fault current study, refer to one-line diagram.
8. Sample Label:

EXHAUST FAN EF-1 ("LOCATED ON ROOF")
480V, 3-PHASE
FED FROM "1HA1-1"
AUTO CONTROL BY FMCS
22,000 AMPS AVAILABLE FAULT CURRENT
DATE OF STUDY: 1 JAN 2017

3.9 EQUIPMENT CONNECTION IDENTIFICATION

A. Products:

1. Nameplates and signs

B. Provide identification for hard wired electrical connections to equipment such as disconnects switches, starters, etc. Plug and cord type connections do not require this specific label.

C. Identification shall be provided for all connections to equipment furnished by this Contractor, other contractors, or the Owner. The following list of equipment is specifically being listed to receive an equipment connection label; this list does not limit the equipment that shall receive a label:

1. Mechanical heating, ventilation, and air conditioning equipment; chillers, boilers, pumps, air handing ventilation units, condensing units, unit heaters, and similar equipment
2. Plumbing equipment
3. Fire protection equipment including fire pumps.

D. Labeling shall include:

1. Equipment type and contract documents designation of equipment being served.
2. Location of equipment being served if it is not located within sight.
3. Voltage and rating of the equipment.
4. Panel and circuit numbers(s) serving the equipment.
5. Available fault current; refer to one-line diagram or panel schedule of panel serving equipment.
6. Date of fault current study; refer to one-line diagram.
7. Sample Label:

UNIT HEATER UH-1 ("LOCATED IN STORAGE ROOM 200")
480V: 3-PHASE
FED FROM "1HA1-1"
22,000 AMPS AVAILABLE FAULT CURRENT
DATE OF STUDY: 1 JAN 2017

3.10 POWER DISTRIBUTION EQUIPMENT IDENTIFICATION

A. Products:

1. Nameplates and signs

B. Provide identification on the front of all power distribution equipment such as panelboards, generators, transfer switches, etc. Labels shall be visible on the exterior of the gear, correspond to the one-line diagram nomenclature.

1. Interior Equipment: The identification material shall be engraved plastic-laminated labels.
2. Exterior Equipment: The identification material shall be engraved vinyl labels.
3. Labeling shall include:

a. Equipment type and contract documents designation of equipment.
b. Voltage of the equipment.
c. Name of the upstream equipment and location of the upstream equipment if it is not located within sight.
d. Rating and type of the overcurrent protection device serving the equipment if it is not located within sight ("FED BY 400A/3P BREAKER").
e. Sample Label:

DISTRIBUTION PANEL DP-H1
480Y/277V
FED FROM SWITCHBOARD "SB-1" (LOCATED IN MAIN ELEC ROOM)
Include circuit number.

4. Provide the following on a separate label, installed below the label above:

a. Available fault current; refer to one-line diagram or panel schedules.
b. Date of fault current study; refer to one-line diagram.

c. Sample Label:

22,000 AMPS AVAILABLE FAULT CURRENT
DATE OF STUDY: 1 JAN 2017

C. Service Equipment Label: A separate nameplate for the service entrance equipment and include:

1. Nominal system voltage, service wire size, quantity, material, distance
2. Maximum available fault current; refer to one-line diagram for values.
3. Clearing time of overcurrent protection devices based on available fault current. Refer to calculations and report from Section 26 05 73 for value.
4. Date of fault current study; refer to one-line diagram.
5. Date of label
6. Sample Label:

480Y/277V, 6 SETS 4#750KCM CU, 75FT
39,800 AMPS AVAILABLE FAULT CURRENT
0.07 SECOND CLEARING TIME
DATE OF STUDY: 1 JAN 2017
DATE OF LABEL: 4 JUL 2017

D. Adjustable-Trip Over Current Protection Label:

1. Provide a separate engraved plastic laminate label adjacent to each overcurrent projection device with adjustable trip settings. Provide label separate from load identification label.

a. Label:

1) Long-time delay:
2) Long-time pickup:
3) Short-time delay:
4) Short-time pickup:
5) Instantaneous:
6) Ground fault delay:
7) Ground fault:

b. Sample Label:

Long-time delay:	10.0
Long-time pickup:	1.0
Short-time delay:	0.15
Short-time pickup:	5.0
Instantaneous:	2.0
Ground fault delay:	0.25
Ground fault:	50.0

E. Distribution panelboards and switchboards shall have each overcurrent protection device identified with name and location of the load being served ("AHU-1 LOCATED IN PENTHOUSE 1"). Provide a separate engraved plastic laminate label adjacent to each overcurrent projection device with feeder wire size, feeder wire quantity, conductor material and distance in feet. Provide label separate from load identification label and adjustable trip settings label.

1. Sample Labels for Feeders:

4#3/0 CU & 1#6 CU GND, 125FT
4#250KCM AL & 1#6 GND CU, 125FT
2 SETS 4#400KCM CU & 1#1 GND CU, 125FT

F. Branch panelboards shall be provided with typed panel schedules upon completion of the project. Existing panelboards shall have their existing panel schedules typed, with all circuit changes, additions or deletions also typed on the panel schedules. A copy of all panel schedules for the project shall be turned over as part of the O&M Manuals. Refer to Section 26 05 00 for other requirements.

3.11 ELECTRICAL WORKING CLEARANCE IDENTIFICATION

A. Products:

1. Safety Yellow paint and custom stencils

B. Provide custom identification of electrical equipment working clearances in mechanical, electrical areas.

C. Identification shall include a painted rectangular box (on the finished floor) in front of the electrical equipment to define the code-required working clearance. Provide additional diagonal stripping inside the rectangle box. All painted stripping shall be safety yellow paint with 3 inch wide stripes.

1. Width of area: Width of equipment or as required by code.
2. Depth of area: Depth as required by code.

3.12 POLE IDENTIFICATION

A. Product:

1. Adhesive labels and field markings
2. Nameplates and signs

B. Lighting poles, bollards and overhead distribution poles shall be individually identified with a unique number, for maintenance purposes. Apply the vinyl label number above the hand hole cover or 24" (610mm) above grade. Bollards may be identified with a number applied inside the luminaire that is visible from the exterior.

END OF SECTION 26 05 53

SECTION 26 05 73 - POWER SYSTEM STUDY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Low voltage distribution system power study.

B. Short-circuit analysis and report.

C. Selective coordination analysis and report.

D. Arc-flash hazard analysis and report.

1.2 RELATED SECTIONS

A. Section 26 05 00 - Basic Electrical Requirements

B. Section 26 24 16 - Panelboards

C. Section 26 32 13 - Packaged Engine Generator Systems

D. Section 26 36 00 - Transfer Switch

1.3 QUALITY ASSURANCE

A. Analyses shall be performed by an agent authorized by the manufacturer of equipment specified in the related specification sections.

1.4 SUBMITTALS

A. Documentation shall bear the seal/signature of the licensed Professional Engineer who performed the analysis.

B. The input for the power system study shall be based on the contract documents, with estimated conductor lengths and field investigation of existing equipment types, sizes, ratings provided by the Electrical Contractor. IMEG will provide a preliminary Power Tools for Windows project file for information, if requested.

C. Documentation of the analyses shall be submitted in a single bound electronic (PDF or equal) format and shall accompany the shop drawing submittals for equipment provided under the related work specification sections. The submittal of these related specification sections will not be reviewed without this documentation. Submit a sample arc-flash hazard label for Owner review and approval prior to printing.

D. Power system study project model shall be submitted on electronic media for review and the Owner's operating and maintenance records.

1.5 REFERENCES

A. NFPA 70 - National Electrical Code (NEC)

B. NFPA 70E - Standard for Electrical Safety in the Workplace

C. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations, latest version

D. ANSI Z535.4 - Products Safety Signs and Labels

1.6 SCOPE

A. Provide a power system study of the electrical system shown on the plans. The study shall include arc-fault analysis, selective coordination analysis and arc flash hazard analysis.

B. Contractor is required to provide a fully coordinated system for the normal and emergency electrical system or emergency electrical system and the associated normal side of each transfer switch and all other locations indicated on the one line diagram. Contractor shall provide overcurrent protective devices with the appropriate models, frame sizes, trip units, etc. as required to provide a selectively coordinated system.

PART 2 - PRODUCTS

2.1 POWER SYSTEM STUDY

A. Power systems study shall be completed in Power Tools for Windows (PTW) version 9 or later version or pre-approved equivalent program.

B. Power system studies including, but not limited to short-circuit analysis, selective coordination, and arc-flash analysis are inherently iterative in nature. The initial and subsequent analysis commonly requires engineering evaluation, equipment modification, setting adjustments, and revised analysis report. The power system analysis scope shall not be considered complete until all outstanding engineering, equipment and device setting solutions have been resolved and documented by a final report. The power system study vendor shall provide inclusive bid provisions for the initial, subsequent, final analysis and associated reports.

PART 3 - EXECUTION

3.1 SHORT-CIRCUIT ANALYSIS

A. Provide a complete short-circuit analysis from the utility service to and including the entire building distribution as shown on the drawings.

B. Analysis shall include the entire distribution system from the point of connection to the utility power source to the distribution panels and branch circuit panelboards.

C. Short-circuit analysis documentation shall be made in one-line diagram form showing the magnitude and location of each calculated fault. Fault current calculations shall be made at the main bus of each switchboard, distribution panel, and branch circuit panel. A summary of the fault currents available shall also be submitted and made available to the AHJ if requested.

3.2 SELECTIVE COORDINATION ANALYSIS

A. Provide a complete selective coordination analysis, comparing time/current curves of the protective devices to be installed to assure complete selectivity between main and downstream devices for code-required branches and branches identified on one-line drawings. Overcurrent protective devices serving the essential electrical system shall selectively coordinate for the period of time that a fault's duration extends beyond 0.01 second. Overcurrent protective devices serving the normal shall selectively coordinate for the period of time that a fault's duration extends beyond 0.01 second.

B. Provide trip settings for all (selectively coordinated and non-selectively coordinated) adjustable trip over current protection devices including long time delay, long time pickup, short time delay, short time pickup, instantaneous and ground fault. Selectively coordinated branches shall be based on the selective coordination study results. Non-selective coordinated branches shall be based on the design trip ratings. Provide selective coordination between all ground fault trip settings.

C. The analysis shall include primary protective device, secondary main panelboard branch feeder devices, generator breaker, distribution panel, panelboard main devices, and branch feeder devices.

D. The analysis shall include all normal, and optional standby overcurrent protection devices served by the same electrical bus and directly in parallel with the emergency branch requiring selective coordination.

E. The coordination plots provided shall indicate graphically the coordination proposed for the system on full-size log forms and shall define the types of protective devices selected, together with proposed time dial and pickup settings required. The plots shall include titles, representative one-line diagrams, legend, complete parameters for transformer(s), and complete operating bands for circuit breaker trip devices, fuses, etc.

1. The long-time region of the coordination plots shall designate the pickups required for the circuit breakers.
2. The short-time region shall indicate the magnetizing in-rush and ASA-withstand-transformer parameter, the circuit breaker, short-time and instantaneous trip devices, fuse-manufacturing tolerance bands, significant symmetrical fault currents, etc.
3. The drawings and specifications indicate the general requirements for motors, motor-starting equipment, and medium-voltage and low-voltage equipment, but additional specific requirements of equipment furnished shall be determined in accordance with the results of the coordination study.

a. The study shall include verification of equipment ratings and settings. The Contractor shall keep the study up-to-date with any project changes which affect the study and submit the revised study for review. A final electronic copy shall be submitted with the record drawings.

F. Provide summary table of adjustable overcurrent protective devices settings for the operating and maintenance manual.

3.3 ARC FLASH HAZARD ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E.

B. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, unit substations, motor-control centers, panelboards, busway, and splitters) where work could be performed on energized parts.

C. Safe working distances shall be based on the calculated arc flash boundary considering an incident energy of 1.2 cal/cm2.

D. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit analysis and coordination study models. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations.

E. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared, and the greatest incident energy must be uniquely reported for each equipment location. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for all normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum and will assume a minimum motor contribution (all motors off). Conversely, the maximum calculation will assume a maximum contribution from the utility and will assume the maximum amount of motors to be operating. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable.

F. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators should be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond 3 to 5 cycles.
2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to 3 per unit after 10 cycles).

G. For each equipment location with a separately enclosed main device (where there is adequate separation between the line side terminals of the main protective device and the work location), calculations for incident energy and flash protection boundary shall include both the line and load side of the main breaker.

H. When performing incident energy calculations on the line side of a main breaker (as required per the above), the line side and load side contributions must be included in the fault calculation.

I. Miscoordination should be checked among all devices within the branch containing the immediate protective device upstream of the calculation location, and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

J. Where it is not physically possible to move outside the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

K. Create and install NFPA 70E compliant labels describing the arc flash hazard level at all switchboards, panelboards, and other locations in the electrical distribution system where work could be performed on energized parts.

L. Labels shall be vinyl or laminated, with a self-adhesive backing, conform with ANSI Z535.4 Products Safety Signs and Labels standard, and include the following:

1. Arc flash boundary
2. Available incident energy calculated in the analysis and the corresponding working distance, or the arc flash personal protective equipment (PPE category) for the equipment, but not both.

M. A list of all hazard categories and the corresponding PPE requirements shall be posted in the main electric room, engineering office, or other location. The list shall be plastic laminate or typewritten and housed in a plastic frame.

3.4 ADJUSTMENTS

A. Manufacturer's authorized representative or Contractor shall set all adjustable protective devices to values indicated in the approved coordination study. Apply settings prior to placing equipment into operation. When the scope of work or execution includes remodel or phases construction, the contractor shall adjust applicable settings as required prior to each system component placed in operation.

B. Wherever the arc flash incident energy exceeds Arc Flash Category 2 (i.e. greater than 8 cal/cm^2), provide options for adjusting breaker trip times, if possible, to reduce energies to Category 2 or below.

3.5 TRAINING

A. Provide four hours of Owner training to explain the implications of arc-flash requirements and work permit procedure.

END OF SECTION 26 05 73

SECTION 26 09 33 - LIGHTING CONTROL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Line and low voltage standalone lighting controls

B. Automatic load control relay (ALCR3)

C. Automatic load control relay (ALCR20)

D. Distributed lighting control

E. Central lighting controls

F. Time switches

1.2 RELATED SECTIONS

A. The lighting system design includes a combination of luminaire sources, lighting control components, programming sequences, and supplementary components for building and energy code compliance. The design uses performance-based specifications for portions of the lighting system to account for the limitation of comparable product solutions available by competitive manufacturers. The Contractor shall reference related specification sections, plans, schedules, and details prior to submitting pricing, submittals, and installation. The Contractor shall coordinate system component compatibility among various manufacturers and suppliers for a turnkey lighting system. Referenced sections include, but are not limited to, the following:

1. 26 51 19 LED Lighting
2. Electrical Drawings: Plans, luminaire schedules, lighting control sequence of operations, diagrams, and details.

1.3 RELATED WORK

A. Section 26 51 19 - LED Lighting

1.4 QUALITY ASSURANCE

A. Manufacturers shall be regularly engaged in the manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. All components and assemblies are to be factory pre-tested prior to delivery and installation.

C. Comply with Electrical Code as applicable to electrical wiring work.

D. Comply with applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.

E. Panels and accessory devices are to be UL listed under UL 916 Energy Management Equipment. Panels and accessories used for control of life safety and critical branch circuits shall be listed under UL 924 Emergency Lighting and Power Equipment.

F. All assemblies are to be in compliance with FCC emissions standards specified in Part 15 Subpart J for Class A applications.

1.5 REFERENCES

A. FCC Rules and Regulations, Part 15, Subpart J - Radio Frequency Interference

B. FS W S 896 Switch, Toggle

C. International Energy Conservation Code (IECC)

D. NEMA WD 1 - General Color Requirements for Wiring Devices

E. NEMA WD 7 - Occupancy Motion Sensors

F. NFPA 70 - National Electrical Code (NEC)

G. UL Standard 916 Energy Management Equipment

H. UL 924 - Emergency Lighting and Power Equipment

I. UL 1472 - Solid-State Dimming Controls

1.6 SUBMITTALS

A. Submit product data under provisions of Section 26 05 00.

B. Submit a comprehensive package including devices, hardware, software, product specification, finishes, dimensions, installation instructions, warranty, system software requirements.

C. Provide floor plan showing location, orientation, and coverage area of each control device, sensor, and controller/interface. For areas requiring multiple sensor devices for appropriate coverage, submit specific manufacturer-approved sensor layout as an overlay directly on the project drawings, either in print or approved electronic form.

D. Submit a list of devices and equipment that will be installed for each sequence of operation.

E. Submit project specific control wiring diagrams showing all equipment, line voltage, and control wiring requirements for all components including, but not limited to, dimmers, relays, low voltage switches, occupancy sensors, control stations, and communication interfaces and programming instructions for each sequence of operation. Include network cable specification and end-of-line termination details, if required.

F. Coordinate integration with mechanical and/or other trades.

G. Verify acceptance of communications connection to building automation system. Submit BACnet IP parameters.

1.7 EXTRA STOCK

A. Provide extra stock under provisions of Section 26 05 00.

1.8 PROJECT RECORD DOCUMENTS

A. Submit project record documents under provisions of Section 26 05 00.

B. Accurately record location of all controls and devices. Include description of switching sequences and circuiting arrangements.

1.9 OPERATION AND MAINTENANCE DATA

A. Submit emergency, operation, and maintenance data under provisions of Section 26 05 00. Data shall also include the following:

1. Schedule for routine maintenance, inspection, and calibration of all lighting control devices and system components. Recommended schedule for inspection and recalibration of sensors.
2. Complete narrative describing intended operation and sequence for each control scenario and system component, updated to reflect all changes resulting from commissioning of systems. Narrative shall indicate recommended settings for devices where applicable.
3. Replacement part numbers for all system components.

B. Identify installed location and labeling for each luminaire controlled by automated lighting controls.

1.10 SYSTEM DESCRIPTION

A. Performance Statement: This specification section and the accompanying lighting design documents describe the minimum material quality, required features, and operational requirements of the lighting control system (LCS). These documents do not convey every wire that must be installed and every equipment connection that must be made. Based on the performance required of the system, as presented in these documents, the Contractor and system manufacturer/vendor are solely responsible for determining all equipment, wiring, and programming required for a complete and operational system.

B. Provide an integrated lighting controls system consisting of panels, power supplies, controllers, sensors, relays, switches, devices, wiring, etc. necessary to perform the Lighting Control Sequence of Operation as defined on the plans and specifications. Contractor is responsible for confirming that all components and luminaires interoperate as a single system.

1. Sequence of Operation: Describes the required operation and performance for lighting control in each space. Sequences of operation are indicated on the drawings.
2. Drawings: The drawings include sequences of operation, locations of control interface devices, sensors, and control zones. Wiring and additional equipment to make a complete and functioning system has not been shown, but shall be submitted with the shop drawings.

C. The following control types and features are acceptable. Acceptable control locations are shown on the drawings.

1. Line Voltage Control: Control equipment consists of traditional line voltage wiring devices and equipment such as switches, dimmers and combination occupancy/vacancy sensor switches, etc.
2. Distributed Control: Control equipment is in the space/zone being controlled; not reliant on centralized controllers.

    a. All locations shall have the ability to be networked for remote control and monitoring, but network connections are not required.

3. Centralized Control: Control equipment is in a central location serving multiple spaces/zones and provides time-based schedule and remote control.

    a. The lighting control system (LCS) shall be networked with BACnet IP capabilities.

4. Wireless Control: Equipment that uses radio frequency to transmit lighting control signals.

1.11 WARRANTY

A. Manufacturer shall warrant products under normal use and service to be free from defects in materials and workmanship for a period of two (2) years from date of commissioning.

B. Occupancy, vacancy, daylight sensors and controls shall have a five (5) year warranty from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LIGHTING CONTROLS

A. All items of material having a similar function (e.g., switches, dimmers, sensors, contactors, relays, etc.) shall be of the same manufacturer, unless specifically stated otherwise on drawings or elsewhere in the specifications. Lighting control switches, systems, and components shall be listed.

B. Color of lighting controls and sensors shall match the receptacle wiring devices specified in the space.

C. The functions described in the lighting sequence of operation shall dictate the actual lighting control device required to accomplish the functions described for the space.

2.2 LIGHTING CONTROL STATION

A. SW; The lighting control station shall contain the controls required by the lighting sequence of operation in a common coverplate. The controls may consist of switches, dimmers, occupancy sensors, pushbuttons, etc.

1. In spaces where the wall control station is shown in multiple locations, the sequence of operation shall be the same at all locations, unless noted otherwise.
2. The controls supplier shall prepare control station shop drawings showing arrangement of controls, dimensioned elevations, wiring diagram, and recommended backboxes. The shop drawing submittal should be identified with the lighting sequence that the station provides. Submit data sheets on the switches, dimmers, sensors, buttons, etc. contained in the control station.

2.3 DEVICE COLOR

A. All switch, lighting controls, and coverplate colors shall be the same as wiring devices, unless indicated otherwise.

2.4 COVERPLATES

A. All switches and lighting controls shall be complete with coverplates that match material and color of the wiring device coverplates in the space.

B. Where several devices are ganged together, the coverplate shall be of the ganged style for the number of devices used.

C. Install nameplate identification as indicated in Section 26 05 53.

D. Plate-securing screws shall be metal with head color matching the wall plate finish.

2.5 WALL SWITCHES

A. Refer to Electrical Symbols List for device type.

B. Switch touch surfaces shall have an antimicrobial additive that suppresses the growth of harmful bacteria, mold, mildew, and fungi. Coverplate color shall match the switch color.

C. SW-1P; Single Pole Switch:

1. Single throw, 120/277-volt, 20-amp maintained contact. Toggle handle, side and back wired.
2. Manufacturers:

a. Hubbell HBL1221
b. Leviton 1221-2
c. Pass & Seymour PS20AC1
d. Cooper AH1221

3. Single throw, 120/277-volt, 20-amp maintained contact. Rocker handle, side and back wired.
4. Manufacturers:

    a. Hubbell DS120
    b. Leviton 5621
    c. Pass & Seymour 2621
    d. Cooper 7601.

D. SW-1P-WP; Weatherproof Single Pole Switch:

1. Single throw, 120/277-volt, 20-amp maintained contact. Toggle handle, side and back wired. Provide with weatherproof coverplate.
2. Manufacturers:

    a. Hubbell1221/HBL1795
    b. Leviton 1221-2
    c. Taymac MM180
    d. Pass & Seymour PS20AC1/CA1-GL
    e. Cooper 2221.

E. SW-2P; Two Pole Switch:

1. Single throw, 120/277-volt, 20-amp maintained contact. Toggle handle, side and back wired.
2. Manufacturers:

    a. Hubbell HBL 1222
    b. Leviton 1222-2
    c. Pass & Seymour PS20AC2
    d. Cooper 2222.

3. Single throw, 120/277-volt, 20-amp maintained contact. Rocker handle, side and back wired.
4. Manufacturers:

    a. Hubbell DS220
    b. Leviton 5622
    c. Pass & Seymour 2622
    d. Cooper 7622

F. SW-3W; Three-way Switch:

1. 120/277 volt, 20 amp. Toggle handle, side and back wired.
2. Manufacturers:

    a. Hubbell 1223
    b. Leviton 1223-2
    c. Pass & Seymour PS20AC3
    d. Cooper AH1223

3. 120/277-volt, 20-amp maintained contact. Rocker handle, side and back wired.
4. Manufacturers:

    a. Hubbell DS320
    b. Leviton 5623
    c. Pass & Seymour 2623
    d. Cooper 7623

G. SW-4W; Four-way Switch:

1. 120/277 volt, 20 amp. Toggle handle, side and back wired.
2. Manufacturers:

    a. Hubbell 1224
    b. Leviton 1224-2
    c. Pass & Seymour PS20AC4
    d. Cooper AH1224

2.6 WALL DIMMERS

A. UL listed with integral air-gap switch for on/off control.

B. Integral EMI/RFI suppression.

C. Non-viewable heat sink.

D. Dimmer compatibility and wiring with the load being controlled shall be verified by Contractor prior to purchase and installation.

E. Dimmer to match device color.

F. SW-D-LED; LED Electronic Driver Dimmer:

1. 120 -volt, decora style linear slider operator with positive off. Color to match adjacent devices. Luminaire manufacturer shall list compatible dimmer manufacturers and models. 0-10V dimmers shall comply with IEC 60629 Annex E.
2. Manufacturers:

    a. Compatible with provided LED driver.

G. SW-OD; Wall 0-10V Dimmer / Occupancy sensor:

1. Wall switch with manual on/auto off. 120VAC load rating of 0-800 W for electronic ballast, LED. 277VAC load rating of 0-1,800 W for electronic ballast, LED. adjustable OFF delay. 0-10V dimming with up to 30ma sink. Automatic ON/OFF, manual ON/automatic OFF, or occupancy on to predetermined dimming level go to last dimming setting upon occupancy.
2. Manufacturers:

    a. Sensor Switch WSX D Series

2.7 LOCAL DAYLIGHTING CONTROLS

A. SW-LS-PC; Standalone Exterior Photo Sensors:

1. Sensor shall be within a weatherproof enclosure, with design operation in temperatures of -30°F to +130°F. Sensor shall have threaded stem for box mounting, with knuckle to permit aiming of receptor after installation. Sensor shall be mounted facing north.
2. Sensor shall contain an integral switching contactor rated for 277-volt operation, with loads of up to 1,800 VA. Contacts shall be configured for zero-crossing closure to provide 100,000 cycle minimum operation.
3. Sensor shall detect changes in daylight levels to provide triggering of exterior lighting equipment based on the sequence of operation.
4. Sensor shall be field configurable at the device or via handheld wireless remote controller. Configurable settings shall include:

    a. Ambient sensitivity range of 5 to 1,500 foot-candles.
    b. Adjustable setpoint.
    c. Deadband adjustment by percentage of setpoint.
    d. Time delay of up to five minutes.

5. Sensor shall be equipped with a lens cover that can be applied for system testing during daylight conditions.
6. Manufacturers:

    a. Paragon
    b. Tork
    c. Intermatic

2.8 INDOOR OCCUPANCY AND VACANCY SENSORS

A. General Description: Wall- or ceiling-mounting, solid-state units with a separate power supply/relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied, with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes. Vacancy sensors require a manual switch operation to turn lights on and off, with a time delay for turning lights off when unoccupied.
2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20 A ballast load at 120 and 277 VAC, for 13-amp tungsten at 120 VAC, and for 1 hp at 120 VAC. Power supply to sensor shall be 24 V dc, 150-mA, Class 2 power source as defined by Electrical Code.
4. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure. Mount relay above accessible ceiling near entry door to room or area.
    c. Time Delay and Sensitivity Adjustments: Recessed and concealed.

5. Indicator: LED to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.
7. Power Supply and Child Packs: Provide as required for sensor quantity and switching scheme. Mount to standard 1/2" knockout on electrical box above accessible ceiling near entry door to room or area. Sensor power shall be from emergency circuit if emergency lighting is in the area.
8. Detection Coverage (Room): Detect occupancy anywhere in an area based on hand motion.
9. Detection Coverage (Corridor): Detect occupancy based on a half-step motion.
10. Warranty: Five (5) year warranty.

B. Dual-Technology Type: Detect occupancy by using a combination of PIR and ultrasonic or acoustic detection methods in area of coverage. Particular technology or combination of technologies that controls on and off functions shall be selectable in the field by operating controls on unit.

1. SW-VS-D or SW-OC-D; 360 Degree Coverage Pattern:

    a. Frequency greater than 40 KHz. Dual sensing verifications (requires both technologies to activate), either technology maintains on status. Integrated ambient light level sensor (2 to 200 FC range), adjustable sensitivity and time delay, integrated isolated relay contact. Sensor shall control all circuits in area, unless noted otherwise. Initial settings: ambient sensor 40 FC.
    b. Manufacturers:

        1) Watt Stopper DT 300 Series
        2) Hubbell OMNI-DT2000 or ATD2000C
        3) Greengate OAC-DT
        4) Leviton OSC##-MOW
        5) Sensor Switch CM PDT 10

2. SW-VS-D-W or SW-OC-D-W; Wall Mounted on Adjustable Swivel Mount:

    a. Wall or ceiling sensor with adjustable settings to allow manual on/auto off or auto on/auto off. Integrated ambient light level sensor (2 to 100 FC range).
    b. Manufacturers:

        1) Watt Stopper DT-200 Series
        2) Hubbell LODTRP
        3) Leviton OSM12--M series

3. SW-OC-P-O; Wall Switch:

    a. Wall switch with manual on/auto off. 120/277 VAC load rating of 0-800 W for ballast, LED or tungsten. 5-, 15-, 30-minute adjustable OFF delay. Coverage of minor motion in 12' x 15' pattern.
    b. Manufacturers:

        1) Watt Stopper DW-100 Series
        2) Hubbell LHMTS, Leviton OSSMT series

4. Sensitivity Adjustment: Separate for each sensing technology.
5. Detection Coverage:

    a. Task Areas: Detect occupancy anywhere in an area based on hand motion.
    b. Circulation Areas: Detect occupancy anywhere in an area based upon half-step walking motion.

C. Mask sensors where necessary to prevent nuisance switching from adjacent areas.

D. PIR Type: Detect occupancy by sensing a combination of heat and movement in area of coverage.

1. SW-OC-P-P; Ceiling Mounted - 360 Degree Coverage Pattern:

    a. Passive infrared, zero crossing circuitry, integrated ambient light sensor (4 to 190 FC Range), adjustable sensitivity and time delay, integral isolated relay contact. Sensor shall control all circuits in the area unless noted otherwise. Initial settings: ambient sensor 40 FC.
    b. Manufacturers:

        1) Watt Stopper CI Series
        2) Sensor Switch CM-9
        3) Hubbell Automation Omni-IR
        4) Leviton OSC Series
        5) Greengate OMR-P Series

2. SW-OC-P-W; Wall Mounted - 100 Degree Coverage Pattern:

    a. Passive infrared, zero crossing circuitry, integrated ambient light sensor (4 to 190 FC range), adjustable sensitivity and time delay, integral isolated relay contact. Sensor shall control all circuits in the area unless noted otherwise. Initial settings: Ambient sensor 40 FC.
    b. Manufacturers:

        1) Watt Stopper WPIR Series
        2) Sensor Switch CM-9
        3) Hubbell LOIRWV or ATD1600W

3. With daylight filter and lens to afford coverage applicable to space to be controlled.

E. Ultrasonic Type: Ceiling mounting. Detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.

1. SW-OC-U-A; 360 Degree Two-Sided Corridor Coverage Pattern:

    a. Frequency greater than 32 KHz solid state, adjustable sensitivity and time delay, integral isolated relay contact, temperature and humidity resistant receivers. Sensor shall control all circuits in area, unless noted otherwise.
    b. Manufacturers:

1) Watt Stopper WT-2250 Series
2) Hubbell OMNI-US or ATU series
3) Greengate ODC-U Series

2. Crystal controlled with circuitry that causes no detection interference between adjacent sensors.

2.9 AUTOMATIC LOAD CONTROL RELAY (ALCR) (INDIVIDUAL LUMINAIRE - INTEGRAL)

A. This section includes information related to factory and field installed ALCR devices intended for individual luminaires.

B. ALCR3; Automatic Load Control Relay ALCR, 120/277 volt, dry/damp listed, 32°F to 113°F (0°C to 45°C) operating temperature, plenum NEMA 1 rated, test button with visual indicator, remote test and fire alarm control, listed for factory or field installation within luminaire, UL924 listed latest edition, Electrical Code Article 700 compliant.

1. Operation:

a. ALCR device shall allow the same local lighting control devices to control both the normal lights and emergency designated lighting. Devices that require separate local lighting controls for the normal and designated emergency lighting are NOT allowed.
b. ALCR device shall monitor the normal power circuit and shunt/bypass the local lighting controls upon loss of power, remote test switch, or fire alarm override to provide full lumen output for designated emergency lighting.
c. ALCR device shall return designated emergency lighting to local lighting control after a 15-minute delay upon return of normal power or remote test/fire alarm override release.
d. Performance Equivalent by Other Components: A limitation of equivalent comparable products may require some of the required functions of the ALCR device to be provided by an alternative component of the lighting control system. The following functions may be performed by alternative components of the lighting control system when the device is listed for the required function and compatible with the lighting control system.

1) Remote test switch / fire alarm override interface.
2) The 15-minute time delay upon return of normal power or remote test/fire alarm override release.

e. Accessory - Remote Test Switch: Provide a remote button test switch for all devices associated with the same lighting control zone. The test switch shall be a single gang type switch compatible with the ALCR device and allow the remote fire alarm override to function.

1) Test Switch Mounting:

a) Finished Spaces (ceiling height 10 feet or less): Flush mount device in finished ceiling adjacent to one of the emergency lights.
b) Finished Spaces (ceiling height greater than 10 feet): Flush mounted in wall. Refer to Architect/Engineer for location.
c) Unfinished Spaces: Adjacent and aligned with local wall-mounted lighting controls.

2. Manufacturers:

a. LVS Controls EPC-2-FM (switched)
b. EPC Series (alternative lighting control)
c. ETC-DR (0-10V dimming)
d. Lighting control manufacturer

2.10 DISTRIBUTED LIGHTING CONTROL

A. Manufacturers: as listed below meet the qualifications as outlined in this specification. Contractor is responsible for verifying that selected manufacturer is capable of furnishing the complete system as specified herein.

1. Acuity Controls nLight Series
2. Legrand Watt Stopper DLM Series
3. Hubbell Automation NX Series
4. Eaton Greengate RC3 Series (room-based system)
5. Lutron

B. System Description: The lighting control system shall be a network of remote modules. System includes all associated wiring, relay modules, photocells, switches, dimmers, time clock, occupancy sensors. System shall utilize distributed relays modules, allowing these relay modules to be located above accessible ceilings in or adjacent to rooms they are controlling.

C. Control Devices: All occupancy sensors (ultrasonic, IR and dual technology type), photocells, switches, and timers shall be provided with system and designed to operate on system network. Supplemental power packs shall be provided as required for multiple control devices. This equipment shall be identified in shop drawing submission.

D. Relay Modules: Mounted in NEMA enclosure with physically separate 120/277-volt wiring compartment from low voltage control wiring. Provide low voltage digital communication to control devices as shown on drawings and schedules. Supplemental power packs shall be provided as required for multiple control devices. This equipment shall be identified in shop drawing submission. Dimmable relay modules shall be provided where indicated. Relay modules shall contain up to four (4) relays. Relay modules shall be labeled with room number that relays control lighting within.

E. Single-Pole Relays: Mechanically held unless otherwise indicated; split-coil, momentary-pulsed type, rated 20 A, 125-volt AC for tungsten filaments and 20 A, 277-volt AC for electronic ballasts, 50,000 cycles at rated capacity.

F. System shall include server / central station with operating software, data network, and BACnet IP communication with other systems as described. System communication protocol shall be compatible with the building automation system.

G. System server / central station shall provide programmable operation of lights connected via system relays and controlled with system devices. System software shall provide control of relays and control devices, time and sequence scheduling, timed out and blink light operation, and monitoring and reporting of system events and components. Initial programming shall be as shown on plans and schedules.

H. Network Hub: Network Hub shall contain processor and astronomic time clock for control and monitoring of lighting. Network hub shall be fed from an equipment emergency circuit at a minimum.

2.11 CONDUCTORS AND CABLES

A. Control Wiring:

1. Where installed with the line-voltage wiring, control wiring shall be copper conductors not smaller than No. 16 AWG with insulation voltage rating and temperature rating equal to that of the line-voltage wiring, complying with Division 26 Section 26 05 13 "Wire and Cable."
2. Tap conductors to switches or relays: Stranded copper conductors of 16 AWG or solid 16 or 18 AWG with insulation rating equal to that of the line-voltage wiring.
3. Tap conductors to dimming ballasts: Solid copper conductors of 18 AWG with insulation voltage rating equal to that of the line-voltage wiring and insulation temperature rating not less than 90°C.
4. Network cabling as required by manufacturer.

B. Splices and Taps:

1. Tapping or wire trap connectors shall be used to splice all Class 1 and Class 2 control wiring. Twist-on, wire-nut type connectors are not allowed.

PART 3 - EXECUTION

3.1 PRE-CONSTRUCTION MEETING

A. Schedule a pre-construction meeting with the controls representative, installing contractor, Architect/Engineer, and Owner to explain the proposed lighting control centralized, wireless, and distributed systems.

3.2 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Verify field dimensions and coordinate physical size of all equipment with the architectural requirements of the spaces into which they are to be installed. Allow space for adequate ventilation and circulation of air.

C. Verify that required utilities are available, in proper location, and ready for use.

D. Beginning of installation means installer accepts existing conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings.

B. All wiring shall be installed in conduit. Class II low voltage control wiring may be open wiring and shall maintain 150 mm (6 inch) spacing from electronic ballast and other RFI/EMI sources.

C. All branch load circuits shall be live tested before connecting the loads to the lighting control panel.

3.4 Automatic Load Control Relays (ALCR20)

A. Field install per manufacturer requirements.

B. Remote Test Switch: Provide connection to remote test switch.

C. Fire Alarm Override: Provide connection to addressable fire alarm relay.

3.5 SUPPORT SERVICES

A. System Startup:

1. Manufacturer shall provide factory authorized technician to confirm proper installation and operation of all system components.

B. Testing:

1. System shall be completely functional tested by a factory-authorized technician. All loads shall be tested live for continuity and freedom from defects, and all control wiring shall be tested for continuity and connections prior to energizing the system components.
2. Programming of initial zones, schedules, lighting levels, control station groups, and sensor settings shall be performed by a factory-authorized technician. Lighting Control Sequence of Operation shall serve as a basis for programming, However, all final decisions regarding groups and schedules shall be at the direction of the Owner. The following procedures shall be performed at a minimum:

    a. Confirm occupancy sensor placement, sensitivity, and time delay settings to meet specified performance criteria.
    b. Confirm daylight sensor placement, sensitivity, deadband, and delay settings to meet specified performance criteria.

c. Confirm that schedules and time controls are configured to meet specified performance criteria and Owner's operating requirements.

3. Verify occupancy/vacancy and daylight sensor operation is correct after furniture and equipment is installed in each area. Make adjustments to sensor settings and time delays to allow proper operation.
4. Verify occupancy/vacancy sensors are located to provide complete coverage for the area served with no nuisance switching.

a. Relocate sensors or provide additional sensors as necessary to provide adequate coverage.
b. Mask occupancy sensors where necessary to prevent nuisance switching from adjacent areas.

C. Training:

1. Manufacturer shall provide competent factory-authorized technician to train Owner personnel in the operation, maintenance and programming of the lighting control system. Submit training plan with notification seven (7) days prior to proposed training dates.
2. Training duration shall be no less than three (3) days, with one (1) day being scheduled at least two (2) weeks after initial training.

D. Documentation:

1. Manufacturer shall provide system documentation including:

a. System one-line showing all panels, number and type of control stations and sensors, communication line, and network or BMS/BAS interface unit.
b. Drawings for each panel showing hardware configuration and numbering.
c. Panel wiring schedules.
d. Typical diagrams for each component.

3.6 SYSTEM COMMISSIONING

A. Contractors' tests shall be scheduled and documented in accordance with the commissioning requirements. Refer to Section 01 09 00, General Commissioning, for further details.

B. System verification testing is part of the commissioning process. Verification testing shall be performed by the Contractor and witnessed and documented by the Commissioning Agent. Refer to Section 01 09 00, General Commissioning, for system verification tests and commissioning requirements.

C. Training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative. The instruction shall be scheduled in coordination with the Owner's Representative after submission and approval of formal training plans. Refer to Section 01 09 00, General Commissioning, for Contractor training requirements.

END OF SECTION 26 09 33

SECTION 26 20 00 - SERVICE ENTRANCE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Arrangement with Utility Company for permanent electric service.

B. Underground service entrance

1.2 RELATED SECTIONS AND WORK

A. Refer to the One-Line Diagram for additional information.

1.3 QUALITY ASSURANCE

A. Utility Company: Ameren Illinois.

B. Contact: Scott Patterson 618-346-1219 email: 126931@ameren.com.

C. Install service entrance in accordance with Utility Company's rules and regulations.

1.4 SUBMITTALS

A. Submit Utility Company prepared drawings (if applicable).

1.5 SYSTEM DESCRIPTION

A. System Voltage: 208Y/120 volts, three phase, four-wire, 60 Hertz.

PART 2 - PRODUCTS

2.1 METERING EQUIPMENT

A. Meter Base: Furnished by the Contractor, as approved by the Utility Company. (Manufacturers: Milbank, Superior, Duncan, or Anchor).

B. Metering Transformer Compartment: Furnished as part of the main switchboard to Utility Company's specifications.

C. MC-1; Exterior Mounted Metering Cabinets: Furnished and installed by the Contractor to Utility Company's specifications. Conduit and conductors between metering cabinets and instrumentation shall be by the Contractor. Connections as required by the Utility Company.

2.2 IDENTIFICATION

A. Provide a permanent plaque or sign denoting all services, feeders, and branch circuits supplying the building or structure and the area served by each. Install plaque or sign at each service disconnecting means.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Make arrangements with Utility Company to obtain permanent electric service to the Project.

B. Primary distribution equipment and pad-mounted transformers shall be furnished and installed by the Utility Company.

C. Primary conductors shall be furnished, installed, and terminated by the Utility Company. Primary conduit shall be furnished and installed by the Contractor, as shown on the drawings, to the Utility Company's requirements.

D. Underground: Install service entrance conduits in concrete envelope from Utility Company's pad mounted transformer to meter cabinet and building service entrance equipment. Utility Company will connect service conductors to transformer secondary lugs.

E. Overhead: Install a rigid metal weather head and service entrance conductors. Service entrance conductors shall have a 3' drip loop beyond the weather head. Overhead service shall comply with NEC 230 Part II.

F. Concrete Pad for Transformer: Furnished and installed by the Contractor to Utility Company's specifications.

END OF SECTION 26 20 00

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Service and distribution panelboards: MDP-#

B. Lighting and appliance branch circuit panelboards: Panel '###'

1.2 |RELATED SECTIONS AND WORK

A. Refer to the Electrical Distribution Diagram and Electrical Schedules for size, rating, and configuration.

1.3 REFERENCES

A. NEMA AB 1 - Molded Case Circuit Breakers

B. NEMA FU 1 - Low voltage cartridge fuses

C. NEMA KS 1 - Enclosed Switches

D. NEMA PB 1 - Panelboards

E. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less

F. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment

G. UL 248 - Low-Voltage Fuses

H. UL 67 - Panelboards

1.4 SUBMITTALS

A. Submit shop drawings for equipment and component devices under provisions of Section 26 05 00.

B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

C. Selective Coordination Study: Submit study to prove that all essential electrical systems, emergency systems and legally required standby system panelboards are selectively coordinated with all supply side overcurrent protective devices.

1.5 SPARE PARTS

A. Keys: Furnish four (4) each to the Owner.

B. Fuses: Furnish 10% or a minimum of three (3) spare fuses of each type and rating installed to the Owner.

C. Fuse Pullers: Furnish one (1) fuse puller to the Owner.

PART 2 - PRODUCTS

2.1 RATINGS

A. Definitions:

1. Series rated equipment shall be defined as equipment that can achieve a required UL AIC rating with an upstream device such as a main breaker or a combination of devices to meet or exceed a required UL AIC rating. All series rated equipment shall have a permanently attached nameplate indicating that device rating must be maintained. See Section 26 05 53 for additional requirements.
2. Fully rated equipment shall be defined as equipment where all devices in that equipment shall carry a minimum of the AIC rating that is specified.

B. The panelboards for this project shall be fully rated unless otherwise specifically noted in the Drawings or Specifications.

2.2 MAIN PANELBOARDS

A. General

1. Manufacturers:

a. Square D QMB, I-Line
b. ABB ReliaGear Entelleon
c. Siemens F2, P4
d. Eaton PRL4, PRL5

B. Panelboards: NEMA PB 1; type as shown on the drawings.

C. Enclosure: NEMA PB 1; Type 1.

D. Provide cabinet front with concealed trim clamps and hinged trim on door to allow access to wiring gutters without removal of trim and flush lock. Door hardware shall provide swing clear operation (180-degree swing). Finish in manufacturer's standard gray enamel.

E. Provide panelboards with copper bus, ratings as scheduled on the drawings. Provide copper ground bus in all panelboards.

F. All spaces shown on the one-line diagram shall be fully prepared spaces for future breakers.

G. Minimum Integrated Short Circuit Rating: 100,000 amperes rms symmetrical for 208-volt panelboards or as shown on the drawings.

H. Fusible Switch Assemblies: NEMA KS 1; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

I. Molded Case Circuit Breakers: Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole.

J. Solid State Molded Case Circuit Breakers: (All breakers identified on plans as solid-state with 1,200 ampere frame sizes and below.) Provide molded case switch with electronic sensing, timing, and tripping circuits for fully adjustable time current characteristic settings including ground fault trip, instantaneous trip, long time trip, long time delay, short time trip, and short time delay. Trip setting shall be field programmable with a sealable clear cover.

K. Suitable for use as service entrance equipment. Provide line side (service style) barriers.

2.3 BRANCH CIRCUIT PANELBOARDS

A. General

1. Manufacturers:

a. Square D NQ, NF
b. ABB A Series
c. Siemens P1
d. Eaton PRL1, PRL2

B. Lighting and Appliance Branch Circuit Panelboards: NEMA PB 1; circuit breaker type.

C. Enclosure: NEMA PB 1; Type 1.

D. Provide cabinet front with door-in-door construction, concealed hinge, and flush lock all keyed alike. Door hardware shall provide swing clear operation (180-degree swing). Finish in manufacturer's standard gray enamel.

E. Provide panelboards with copper bus, ratings as scheduled on the drawings. Provide copper ground bus in all panelboards.

F. All unlabeled circuits shown on the panelboard schedule shall be fully prepared spaces for future breakers.

G. All multiple-section panelboards shall have the same dimensional back box and cabinet front size.

H. Minimum Integrated Short Circuit Rating: As shown on the drawings.

I. Provide handle lock-on devices for all breakers serving exit sign and lighting circuits with emergency battery units. Provide handle lock-on devices and red handles for breakers serving fire alarm panels.

J. Molded Case Circuit Breakers: Bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled on the drawings. Do not use tandem circuit breakers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards plumb as indicated on the drawings in conformance with NEMA PB 1.1.

B. Height: 6 feet to handle of highest device.

C. Provide filler plates for unused spaces in panelboards.

D. Provide custom typed circuit directory for each branch circuit panelboard. Provide updated custom typed circuit directory for each existing branch circuit panelboard with new or revised circuits per the scope of work. Label shall include equipment name or final approved room name, room number, and load type for each circuit (examples: SUMP SP-1 or ROOM 101 RECEPT). Revise directory to reflect circuit changes required to balance phase loads. Printed copies of the bid document panel schedules are not acceptable as circuit directories.

E. Install fuses in fusible switch assemblies.

3.2 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION 26 24 16

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Device plates and box covers

B. Receptacles (REC-#)

C. Floor boxes and floor box with service fitting (FB-#)

1.2 QUALITY ASSURANCE

A. Provide similar devices from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the Electrical Code, by a testing agency to Authorities Having Jurisdiction and marked for intended use.

C. Comply with the Electrical Code.

1.3 REFERENCES

A. DSCC W-C-896F - General Specification for Electrical Power Connector

B. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet

C. NEMA WD 1 - General Color Requirements for Wiring Devices

D. NEMA WD 6 - Wiring Devices - Dimensional Requirements

E. NFPA 70 - National Electrical Code (NEC)

F. UL 498 - Standard for Attachment Plugs and Receptacles

G. UL 943 - Standard for Ground Fault Circuit Interrupters

1.4 SUBMITTALS

A. Submit product data under provisions of Section 26 05 00.

B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

1.5 COORDINATION

A. Receptacles for Owner Furnished Equipment: Match plug configurations.

B. Cord and Plug Sets: Match equipment requirements.

C. Coordinate installation of receptacle assemblies below countertops and furniturewith the Contractor providing the countertop or furniture. Contractor shall coordinate penetrations and conduit routing below countertops and furniture with drawings and other obstacles below the installation surface.

PART 2 - PRODUCTS

2.1 DEVICE COLOR

A. All switch, receptacle, and outlet colors shall be verified with Architect, unless indicated otherwise.

2.2 COVERPLATES

A. All switches, receptacles, and outlets shall be complete with the following:

1. Unbreakable thermoplastic/thermoset plastic and match device color coverplates in finished spaces where walls are finished.

B. Where several devices are ganged together, the coverplate shall be of the ganged style for the number of devices used.

C. Install nameplate identification as indicated in Section 26 05 53.

D. Plate securing screws shall be metal with head color matching the wall plate finish.

2.3 RECEPTACLES

A. Refer to Electrical Symbols List for device type.

B. Devices that are shaded on the drawings shall be red.

C. REC-DUP: NEMA 5-20R Duplex Receptacle:

1. Standard Grade: 125-volt, 20 amp, 3-wire grounding type with impact resistant thermoplastic face and steel back strap.

a. Manufacturers:

1) Hubbell 5352A
2) Leviton, 5362-S
3) Pass & Seymour 5362
4) Cooper 5352

D. REC-DUP-GFI: NEMA 5-20R Ground Fault Duplex Receptacle:

1. Standard Grade: 125-volt, 20 amp, 3-wire grounding type with test and reset buttons in impact resistant thermoplastic face, listed.

a. Device shall perform self-test of GFCI circuitry in accordance with UL 943.

b. Manufacturers:

1) Hubbell GF20L
2) Leviton GFNT2
3) Pass & Seymour 2097
4) Cooper SGF20

E. REC-DUP-WP: NEMA 5-20R Weatherproof Ground Fault Duplex Receptacle:

1. 125-volt, 20 amp, 3-wire grounding type with test and reset buttons in impact resistant thermoplastic face, weather resistant WR listed. Provide extra-duty NEMA 3R rated while-in-use cast aluminum cover.
2. Device shall perform self-test of GFCI circuitry in accordance with UL 943.

a. Manufacturers:

1) Hubbell:

a) GFTWRST20 with aluminum housing WP826

2) Leviton GFWT2 with aluminum housing M5979
3) Pass & Seymour 2097TRWR with aluminum housing WIUCAST1
4) Cooper WRSGF20 with aluminum housing WIUMV-1

F. REC-USB: NEMA 5-20R Receptacle with USB Charger:

1. Standard Grade Type C USB: 125-volt, 20-amp, tamper resistant, 3-wire grounding type with impact resistant thermoplastic face.

a. One Type A USB charging rated at 5VDC 3.0A minimum and one Type C USB charging rated at 5VDC 5.0A. Mounted in double gang backbox.
b. Manufacturers:

1) Hubbell USB USB20C5
2) Leviton T5833
3) Pass & Seymour TR20USBAC6W

G. REC-SIM-530R: NEMA 5-30R Simplex Receptacle:

1. 125-volt, 30 amp, 3-wire grounding type, phenolic face.

a. Manufacturers:

1) Hubbell HBL9308
2) Leviton 5371
3) Pass & Seymour 3802
4) Cooper 5716N

H. REC-SIM-1450R: NEMA 14-50R Simplex Receptacle:

1. 125/250-volt, 50 amp, 3-pole, 4-wire grounding type with thermoplastic face. Flush mounted at +4" AFF.

a. Manufacturers:

1) Hubbell HBL9450A
2) Leviton 279
3) Pass & Seymour 3894
4) Cooper 5754N

I. REC-SIM-L530R: NEMA L5-30R Simplex Receptacle Locking Type:

1. 125-volt, 30 amp, 2-pole, 3-wire grounding type with impact resistant thermoplastic face.

a. Manufacturers:

1) Hubbell
2) Leviton
3) Pass & Seymour L530
4) Cooper CWL530R

J. REC-TAMP: NEMA 5-20R Tamper Resistant Duplex Receptacle:

1. Standard Grade: 125-volt, 20 amp, 3-wire grounding type with impact resistant thermoplastic face.

a. Manufacturers:

1) Hubbell BR20TR
2) Leviton TBR20
3) Pass & Seymour TR5362
4) Cooper TRBR20

K. REC-TAMP-GFI: NEMA 5-20R GFI Tamper Resistant Receptacle:

1. Standard Grade: 125-volt, 20 amp, 3-wire grounding type tamper-resistant with test and reset buttons in impact resistant thermoplastic face, listed.

a. Device shall perform self-test of GFCI circuitry in accordance with UL 943.
b. Manufacturers:

1) Hubbell GFTR20
2) Cooper TRSGF20
3) Pass & Seymour 2097TR
4) Leviton GFTR2

L. REC-TAMP-QUAD: NEMA 5-20R Double Duplex Tamper Resistant Receptacle:

1. Consists of two duplex tamper resistant receptacles, double gang box, plaster ring and faceplate.

a. Manufacturers:

1) Refer to Tamper Resistant Receptacle above.

M. REC-QUAD: NEMA 5-20R Double Duplex Receptacle:

1. Consists of two duplex receptacles, double gang box, plaster ring and faceplate.

a. Manufacturers:

1) Refer to Duplex Receptacle above.

N. Back wired devices shall be complete with eight holes that are screw activated with metal clamps for connection to #12 or #10 copper conductors.

O. Side wired devices shall have four binding screws that are undercut for positive wire retention.

P. Ground fault circuit interrupter (GFCI) receptacles shall be listed and comply with UL 943 requiring increased surge immunity, improved corrosion resistance, improved resistance to false tripping and diagnostic indication for miswiring if the line and load conductors are reversed during installation.

2.4 FLOOR BOXES

A. Cover Color and Style: Verify with Architect from manufacturer standard options.

B. Refer to Technology drawings for voice/data, Audio/Video outlet, and coordination requirements.

C. Floor Boxes Housing Material Based on Cast-in-Place Floor Type:

1. Slab on Grade: non-metallic PVC; corrosion resistant.

D. FB-1: Concealed Center Compartment:

1. Floor Box, flush-mounted hinged cover, square/rectangular center service area with closed while-in-use cover and cable egress doors in cover, provide complete with appropriate outlet cover plates and hardware. For use with 4-inch minimum concrete pour floors, fully adjustable, UL 514 scrub water listed.
2. Gang / Outlet Descriptions:

a. Two (2) 125 Volt, 20 amp, NEMA 5-20R duplex receptacle with 3/4-inch conduit.
b. Voice/Data outlet with 1-1/4-inch conduit. Refer to Technology drawings for additional information.
c. Spare with 1-1/4-inch conduit.

3. Manufacturers:

a. Legrand Wiremold RFB Series

b. Hubbell CFB Series
c. ABB Steel City 664/665/667 Series

4. Installation: Group route raceway conduits under slab on grade or in ceiling space below to nearest wall or as shown on plans. Provide provisions to core drill elevated floors and route conduits to ceiling space of associated floor box. Provide hub reducers when applicable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install convenience receptacles at elevations indicated in the General Installation Notes on the contract drawings.

B. Install specific-use receptacles at heights shown on the contract drawings. Install devices level, plumb, and square with building lines. Coordinate installation of adjacent devices of separate systems with common mounting heights, including lighting, power, systems, technology, and temperature control device rough-ins.

C. Ground Fault Protection: Provide ground fault protection for all branch circuit breakers serving 120/208 and electrical outlets rated 50 amps or less single phase and 100 amps or less three-phase in the following locations, as shown on drawings, or required by adopted code:

1. Bathrooms, locker rooms, shower rooms
2. Kitchens' all 120-volt through 250-volt receptacles
3. Buffet, serving, food preparation areas; all 120-volt through 250-volt receptacles
4. Rooftops
5. Interior/Exterior locations subject to damp/wet conditions
6. When located within 6 feet of sinks and shower stalls
7. Plug-and-cord receptacles when the utilization appliance is located within 6 feet of a sink edge.
8. Garages, service bays
9. Specific Appliances: water drink/bottle fill coolers, dishwashers, electric ranges, ovens, microwave ovens

D. Tamper Resistant Protection: Provide tamper resistant protection for all 15 / 20-amp 120/208 straight blade wiring devices in the following locations, as shown on the drawings, or required by adopted code.
1. Common public areas
2. Public Buildings: waiting rooms, common areas, inmate processing areas.

E. Install receptacles vertically with ground slot up or where indicated on the drawings, horizontally with ground slot to the left.

F. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.

G. Install devices and wall plates flush and level.

H. Install nameplate identification to receptacle cover plates indicated. Identification shall identify panel name and circuit number. Refer to Specification Section 26 05 53 - Electrical Identification.

I. Test receptacles for proper polarity, ground continuity and compliance with requirements.

J. Floor Box Installation:

1. Set boxes level and flush with finish flooring material.

END OF SECTION 26 27 26

SECTION 26 28 16 - DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fusible switches

B. Non-fusible switches

C. Enclosures

1.2 RELATED SECTIONS AND WORK

A. Refer to the Disconnect and Starter Schedule for rating and configuration.

1.3 REFERENCES

A. NEMA KS 1 - Enclosed Switches

1.4 SUBMITTALS

A. Submit product data under provisions of Section 26 05 00.

B. Product Data: For each type of enclosed switch, accessory and component indicated, include dimensions, weights, and manufacturer's technical data on features, performance, and ratings.

C. Electrical Characteristics: For each type of enclosed switch, enclosure types, current and voltage ratings, short-circuit current ratings, UL listing for series rating of installed devices, features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.5 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE AND NON-FUSIBLE SWITCHES

A. Acceptable Manufacturers:

1. Square D 3110 Series
2. Eaton DH Series
3. ABB TH Series
4. Siemens HNF / HF Series

B. FDS-#; Fusible Switch Assemblies: NEMA KS 1; Type heavy duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Class 'R' fuse clips only, unless indicated otherwise on the drawings.

C. DS-#; Non-fusible Switch Assemblies: NEMA KS 1; Type heavy duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

D. Enclosures: Type as indicated on the disconnect schedule.

E. Accessories: As indicated on the disconnect schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install disconnect switches where indicated on the drawings.

B. Install fuses in fusible disconnect switches.

C. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.

3.2 ADJUSTING

A. Set field-adjustable circuit breaker trip ranges.

END OF SECTION 26 28 16

SECTION 26 32 13 - PACKAGED ENGINE GENERATOR SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Packaged engine generator system

B. Exhaust silencer and fittings

C. Remote annunciator panel

D. Battery and charger

E. Integrated on-board generator paralleling control

F. Weatherproof enclosure

1.2 REFERENCES

A. ANSI/NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

B. ANSI/NEMA AB 1 - Molded Case Circuit Breakers

C. ANSI/NEMA MG 1 - Motors and Generators

D. NFPA 37 - Installation and Use of Stationary Combustion Engines and Gas Turbines

E. NFPA 70 - National Electrical Code (NEC)

F. NFPA 110 - Standard for Emergency and Standby Power Systems

G. IEEE 446 - Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

H. Environmental Protection Agency EPA Emission Standards for Compressed Ignition Engines

I. Noise Emission: Comply with Illinois Title 35 for maximum noise level at property boundaries due to sound emitted by the generator set, its components and the operation thereof.

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 26 05 00.

B. Submit shop drawings showing plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical diagrams including schematic and interconnection diagrams.

C. Submit product data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, day tank, remote radiator, and remote annunciator.

1. Include work clearance and equipment access information. Clearly identify required equipment access locations for installation, maintenance, testing, and repair.

D. Submit certificates for compliance with EPA Emissions Standards for Compressed Ignition Engines.

E. Submit manufacturer's installation instructions under provisions of Section 26 05 00.

1.4 EXTRA MATERIALS

A. Submit maintenance materials under provisions of Section 26 05 00.

B. Furnish one set of tools required for preventative maintenance of the engine generator system. Package tools in adequately sized metal toolbox.

C. Provide two additional sets of each fuel, oil, and air filter element required for the engine generator system. Provide one fuse for every type and rating used.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 26 05 00.

B. Store and protect products under provisions of Section 26 05 00.

C. Accept packaged engine generator set and accessories on site in crates and verify damage.

D. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

1.6 SYSTEM DESCRIPTION

A. Engine generator system to provide source of emergency and standby power.

B. System Capacity: 200 KW, 250 KVA, 200 starting KVA at specified voltage dip, at an elevation of 1,000 feet above sea level, and ambient temperature between -20°F and 110°F; standby rating using engine-mounted radiator.

C. Emergency Power Supply System (EPSS) shall be NFPA 110 Type 10 Class 24 Level

D. Operation: In accordance with ANSI/NFPA 110.

1.7 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Section 26 05 00.

B. Accurately record location of engine generator and mechanical and electrical connections.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 26 05 00.

B. Include instructions for normal operation, routine maintenance requirements, service manuals for engine and day tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

1.9 QUALIFICATIONS

A. Manufacturer: Company specializing in packaged engine generator system with minimum five (5) years documented experience.

B. Supplier: Authorized distributor of engine generator manufacturer with service facilities within 50 miles of the project site.

1.10 WARRANTY

A. Provide a five (5) year warranty under provisions of Section 26 05 00.

1.11 MAINTENANCE SERVICE

A. Furnish service and maintenance of packaged engine generator system for one (1) year from Date of Substantial Completion. Maintenance service shall be performed by skilled employees of manufacturer's designated service organization. Include quarterly exercising, and routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Maintenance agreements shall include parts, supplies, and labor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Caterpillar.

B. Cummins Power Generation.

C. Kohler.

D. Generac.

2.2 PACKAGED ENGINE-GENERATOR SET (GEN-200)

A. Packaged engine-generator set shall be a coordinated assembly of compatible components. Stationary generators shall be listed.

B. Safety Standard: Comply with ASME B15.1 and UL 2200.

C. Nameplates: Each major system component shall be equipped with a nameplate to identify manufacturer's name and address, model and serial number, and component rating in integrated set and as required by the contract documents.

D. Fabricate engine-generator set mounting frame and attachment of components to resist generator-set movement during a seismic event when generator-set mounting frame is anchored to concrete pad.

E. Mounting Frame: Adequate strength and rigidity to maintain alignment of mounted components without depending on concrete foundation. Mounting frame shall be free from sharp edges and corners and shall have lifting attachments arranged for lifting with slings without damaging components. Provide a rigging diagram permanently attached to the mounting frame to indicate the capacity of each lifting attachment and the generator-set center of gravity.

2.3 ENGINE

A. Type: Water-cooled in-line or V-type, compression ignition diesel electric ignition internal combustion engine.

B. Rating: Sufficient to operate at 100 percent load for two hours at specified elevation and ambient limits.

C. Fuel: Appropriate for use of No. 2 fuel oil.

D. Engine Speed: 1800 RPM.

E. Governor: Isochronous type with speed sensing.

F. Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine overcrank. Limits as selected by manufacturer.

G. Frequency Response:

1. Steady State Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
2. Transient Response: Less than 5 percent for a 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady state operating band within 5 seconds.

H. Fuel System: Engine mounted diesel fuel pump and relief-bypass valve.

I. Fuel Supply System:

1. Base-Mounted Fuel Tank: UL 142 listed fuel tank with 24 hour rated (NFPA 110 minimum run time by class) capacity. Integral rupture basin with leak detection. Provide fueling port with an overfill prevention type receptacle and lockable cap for exterior units. The tank shall include structural steel supports for top mounted engine generator set. Furnish complete with flexible fuel line connectors lockable cover, and analog level gauge. Furnish complete with float switches to indicate low 5% 25% 50% and 75% fuel level. The footprint of the base-mounted fuel tank shall not exceed the footprint of the generator frame for interior applications or the footprint of the enclosure for exterior installations.

J. Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 90°F, and suitable for operation on 120 208-1Ø volts AC. The minimum wattage of the heater shall be as recommended by the manufacturer.

K. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator set mounting frame and integral engine-driven coolant pump.

1. Fan and Core: Nonferrous-metal construction sized to contain expansion of total system. Blower type fan, sized to maintain safe engine temperature in ambient temperature of 110°F. Radiator Airflow Restriction: 0.5 inches of water, maximum.
2. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anti-corrosive additives.
3. Provide expansion tank with gage glass and petcock, and self-contained, thermostatic-control temperature control valve.

L. Engine Starting: DC starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine-generator control panel. Provide the following accessories:

1. Battery: Voltage to match starter with capacity for three cranking cycles without recharge. Provide with battery cables and acid resistant battery tray.
2. Battery-Charging Alternator: Factory mounted on engine with solid state voltage regulation.
3. Remote Start Circuit Monitoring: Provide continuous monitoring of the generator start circuits. A failure shall initiate visual and audible alarms at the generator, remote annunciators, and start the generator.
4. BC-1 Battery Charger: Current limiting type designed to float at 2.17 volts per cell and equalize at 2.33 volts per cell. Include overload protection, full wave rectifier, DC voltmeter and ammeter, and 120 volts AC fused input. Provide wall-mounted enclosure to meet ANSI/NEMA 250, Type 1 requirements.

M. Exhaust System: Critical type silencer (85 dBA max at 10 feet), side inlet with muffler companion flanges and flexible stainless steel exhaust fitting, suitable for horizontal orientation, sized in accordance with engine manufacturer's instructions. Silencer shall include a threaded opening for connection of ¾" drain line. Opening shall be flush on inside of silencer.

N. The packaged engine generator shall comply with the current Environmental Protection Agency EPA Emissions standards.

O. Engine Accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, gear-driven water pump. Include fuel pressure gauge, water temperature gauge, and lube oil pressure gauge on engine-generator control panel.

P. Mounting: Provide unit with suitable spring-type vibration isolators.

2.4 GENERATOR

A. Generator: ANSI/NEMA MG 1; three phase, re-connectible brushless synchronous generator with brushless exciter and PMG alternator excitation.

B. Rating: As indicated on the drawings, at 0.8 power factor, 60 Hertz at RPM to match engine rating.

C. Insulation: ANSI/NEMA MG 1, Class F.

D. Temperature Rise: 105°C continuous.

E. Enclosure: ANSI/NEMA MG 1; open drip-proof.

F. Voltage Regulation:

1. The maximum instantaneous voltage dip (IVD) shall be 28 percent.
2. Include solid-state type voltage regulator, separate from exciter to match engine and generator characteristics, with voltage regulation ±1 percent from no load to full load. Include manual controls to adjust voltage drop ±5 percent voltage level, and voltage gain.

G. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

H. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

2.5 CONTROLS AND INDICATION

A. Operating and safety indications, protective devices, basic system controls, and engine gauges shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.

B. Ground Fault: Provide ground fault sensing at the generator. The sensor shall be located ahead of the generator service disconnect. Provide a ground fault indication on the engine-generator control panel. Provide an instruction nameplate at the control panel.

1. Instruction nameplate: Provide operational instructions for a ground fault indication as approved by the local Authority Having Jurisdiction.

C. GCP-1; Engine-Generator Control Panel: ANSI/NEMA 250, Type 1 generator mounted control panel enclosure with engine and generator controls and indicators. Include provision for padlock and the following equipment and features:

1. Alarm indication as required by NFPA 110 for a Level 1 system.
2. AC frequency meter.
3. AC output voltmeter with phase selector switch.
4. AC output ammeter with phase selector switch.
5. Output voltage adjustment.
6. DC voltmeter (alternator battery charging).
7. Engine start/stop selector switch.
8. Engine running time meter.
9. Oil pressure gauge.
10. Engine coolant temperature gauge.
11. Shut down devices for overspeed, coolant high-temperature, coolant low-level, and oil low-pressure.
12. Fuel derangement alarm.
13. Generator overload.
14. Auxiliary Relay: 3PDT, operates when engine runs, with contact terminals prewired to terminal strip.
15. Remote Alarm Contacts: Pre-wire SPST contacts to terminal strip for remote alarm functions required by ANSI/NFPA 99.
16. Ground fault indication.
17. Generator control and start signal failure.

D. GANN-1I; Remote Engine Annunciator Panel: ANSI/NFPA 99 and NFPA 110 for a Level 1 system. Include the listed pre-alarm and alarm points, audible alarm, alarm silencing means, repetitive alarm circuitry, and lamp test switch in a surface mounted panel with brushed stainless steel finish. Provide all interconnecting wiring in conduit per manufacturer's requirements by the Electrical Contractor. The remotely reported alarms shall include the following.

1. Overcrank
2. Low water (engine) temperature
3. High engine temperature pre-alarm
4. High engine temperature
5. Low lube oil pressure pre-alarm
6. Low lube oil pressure
7. Overspeed
8. Low coolant level
9. Not in auto
10. Emergency Power Supply (EPS) supplying load
11. High battery voltage
12. Low battery voltage
13. Battery charger failure (includes AC failure)
14. Generator running
15. Normal utility power
16. Emergency stop
17. Emergency Power Off Switch activated (EPO)
18. Generator control and start signal failure.

2.6 ACCESSORIES

A. Generator Circuit Breakers: Molded or insulated case, service-rated electronic trip type; 600 A LSI 100% rated breaker complying with NEMA AB1 and UL 489. The disconnect shall simultaneously open all associated ungrounded conductors and be lockable in the open position.

1. Tripping Characteristic: Designed specifically for generator protection.
2. Trip Rating: Matched to generator rating.
3. Shunt Trip: Connected to trip breaker when generator is shut down by other protective devices.
4. Mounting: Provide freestanding enclosure or mount integrally with control and monitoring panel.
5. The disconnecting means shall also shut down the prime mover, disable all start control circuits, and be configured with a mechanical reset.

B. EPO; Remote Manual Stop Station (Emergency Power Off EPO): Provide a remote manual stop station with weather proof stainless steel or die cast housing, red mushroom button - push to stop operation, breakable cover/lens to access mushroom button, 120-volt rated. The manufacturer shall provide automatic monitoring of the EPO switch. Placing the EPO switch in the "Generator Powered OFF" status shall initiate a visual and audible alarm at each generator annunciator panel.

2.7 OUTDOOR GENERATOR SET ENCLOSURE SKIN TIGHT

A. Prefabricated or pre-engineered skintight enclosure with the following features:

1. Construction: Reinforced galvanized steel, metal clad, integral structural steel framed housing anchored to a concrete foundation. Construction shall allow access to control panels and service points. The panels shall enclose all components, including intake/exhaust louvers and sound attenuators. Extend the enclosure base frame as required for panels.
2. The generator control panel shall be located no greater than 5'-0" above finished grade for ease of access.
3. Structural Design and Anchorage: Wind resistant up to 100 mph.
4. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding exterior dust, birds, and rodents. Motor operators shall be spring open, power close operating at 24 volts DC. The louvers shall be connected to the generator starting batteries through appropriate control relays. Louvers shall not extend outside main generator enclosure.
5. Hinged Doors: Provide a minimum of four doors with padlocking provisions. Single doors shall be 36" wide and 84" high. Double doors shall be 60" wide and 84" high. As standard, doors shall include rain-rail moldings above all door openings, recessed, keyed mortise locks, panic bar door hardware and full weather-stripping. Doors shall be removable.
6. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits as required by engine-generator-set components.
7. Fuel Tank Vent: Provide vent piping from the fuel tank to the exterior of the enclosure.

8. Fuel Fill: Provide fill access on the exterior of the enclosure at an elevation not to exceed 5'-0" above finished grade.
9. The exhaust system silencer shall be installed within the enclosure housing.
10. Acoustical Treatment: Provide all acoustical treatment required to conform to Illinois Administrative Code, Title 35, Subtitle H for daytime hours. Noise levels shall include enclosure and tailpipe noise. Sound attenuators shall be concealed within the enclosure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work and field dimensions are as shown on the drawings.

B. Verify that required utilities are available in proper location and ready for use.

C. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install remote manual stop station in location shown on plans. Provide 120 Volt power and wiring in conduit as required. Coordinate installation with the manufacturer approved shop drawings and wiring diagrams. The remote manual stop station shall shunt trip the generator mounted circuit breaker and signal the engine prime mover to stop.

C. The A-B-C phase rotation of the generator source shall match the A-B-C phase rotation of the utility source. The Contractor shall verify the generator and utility phase rotation match to prevent three phase motors and similar loads from operating backwards while being served by the generator.

3.3 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 26 05 00 and in compliance with NFPA 110 requirements.

B. Provide portable test bank for full load test, if required. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown, and return to normal.

C. Fill fuel tank prior to start of test.

D. The on-site installation test shall be conducted as follows:

1. With the prime mover in a "cold start" condition and the emergency load at standard operating level, a primary power failure shall be initiated by opening all switches or breakers supplying the primary power to the building or facility.

2. The test load shall be that load that is served by the Emergency Power Supply System (EPSS).
3. The time delay on start shall be observed and recorded.
4. The cranking time until the prime mover starts and runs shall be observed and recorded.
5. The time taken to reach operating speed shall be observed and recorded.
6. The voltage and frequency overshoot shall be recorded.
7. The time delay on transfer to emergency power for each switch shall be recorded. Emergency branch transfer switches must transfer within 10 seconds.
8. The time taken to achieve a steady-state condition with all switches transferred to the emergency position shall be observed and recorded.
9. The voltage, frequency, and amperes shall be recorded.
10. The prime mover oil pressure and water temperature shall be recorded, where applicable.
11. The battery charge rate shall be recorded at 5-minute intervals for the first 15 minutes and at 15-minute intervals thereafter.
12. When primary power is returned to the building or facility, the time delay on retransfer to primary for each switch with a minimum setting of 5 minutes shall be recorded.
13. The time delay on the prime mover cool down period and shutdown shall be recorded.
14. Allow prime mover to cool for 5 minutes.
15. A load shall be applied for 4 hours total. The building load shall be permitted to serve as part or all of the load, supplemented by a load bank of sufficient size to provide a load equal to 100 percent of the nameplate rating of the Emergency Power Supply (EPS), less applicable derating factors for site conditions. Observe and record load changes and the resultant effect on voltage and frequency.
16. The full load test shall be initiated immediately after the cooling time has expired by any method that starts the prime mover and, immediately upon reaching rated rpm, picks up 100 percent of the nameplate kW rating on one step, less applicable derating factors for site conditions.
17. During test, record the following at 5-minute intervals for the first 15 minutes and every 15 minutes for the rest of the test:

    a. Kilowatts
    b. Amperes
    c. Voltage
    d. Frequency
    e. Coolant temperature
    f. Enclosure temperature (interior)
    g. Oil pressure
    h. Engine exhaust temperature
    i. Engine inlet temperature
    j. Oil Temperature
    k. Battery charge rate

18. Upon completion of the test and after a cool down period, the crank/rest cycle shall be tested.

    a. Any method recommended by the manufacturer for the cycle crank test shall be utilized to prevent the prime mover from running.

b. The control switch shall be set at "run" to cause the prime mover to crank.
c. The complete crank/rest cycle shall be observed and recorded.

19. Test alarm and shutdown circuits by simulating conditions.

E. Contractor shall fill fuel tanks upon completion of test.

F. Testing documentation shall be submitted to the Architect/Engineer for review and approval.

3.4 MANUFACTURER'S FIELD SERVICES

A. Prepare, start, test, and adjust systems under provisions of Section 26 05 00.

3.5 ADJUSTING

A. Adjust generator output voltage and engine speed.

3.6 CLEANING

A. Clean work under provisions of Section 26 05 00.

B. Clean engine and generator surfaces. Replace oil and fuel filters.

3.7 DEMONSTRATION

A. Provide systems demonstration. Coordinate the demonstration schedule with the Owner and Architect/Engineer.

B. Describe loads connected to emergency and standby systems and restrictions for future load additions.

C. Simulate power outage by interrupting normal source and demonstrate that system operates to provide emergency and standby power.

END OF SECTION 26 32 13

SECTION 26 36 00 - TRANSFER SWITCH

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Automatic transfer switch ATS-#

1.2 RELATED SECTIONS AND WORK

A. Refer to the Transfer Switch Schedule for rating and configuration.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in automatic transfer equipment with three (3) years documented experience.

1.4 REFERENCES

A. NEMA ICS 1 - General Standards for Industrial Control and Systems

B. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies

C. NEMA ICS 6 - Enclosures for Industrial Controls and Systems

D. NEMA ICS 10 - Guide to Application of Low-Voltage Automatic Transfer Switch Equipment

E. UL 1008 - Standard for Automatic Transfer Switches

F. NFPA 110 - Standard for Emergency and Standby Power Systems

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 26 05 00.

B. Submit product data for transfer switches showing overall dimensions, electrical connections, electrical ratings, and environmental requirements.

C. Submit manufacturer's installation instructions under provisions of Section 26 05 00.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 26 05 00.

B. Include instructions for operating equipment.

C. Include instructions for operating equipment under emergency conditions when engine generator is running.

D. Identify operating limits which may result in hazardous or unsafe conditions.

E. Document ratings of equipment and each major component.

F. Include routine preventive maintenance and lubrication schedule.

G. List special tools, maintenance materials, and replacement parts.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for emergency and standby electrical systems.

PART 2 - PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCH

A. Acceptable Manufacturers, Standard Grade:

1. Schneider Electric ASCO 300 Series
2. Siemens Russelectric RMT Series
3. ABB Zenith ZTG Series
4. Caterpillar CTG Series
5. Cummins OTPC Series
6. Generac W Series
7. Kohler KCS Series

B. Description: NEMA ICS 2; automatic transfer switch.

C. Configuration: Electrically-operated, three-position delayed transition / off capable, mechanically-held transfer switch.

D. Control panel shall be micro-processor based.

2.2 PORTABLE GENERATOR (GCC-1)

A. Acceptable Manufacturers:

1. Trystar
2. Foxfab FFCC Series
3. Berthold Electric Co
4. Power Temp Systems Inc
5. ESL Power Systems Triple Switch Series

B. Pad mount, powder coat painted NEMA 3R housing with lockable door, 600 amps, 600 volt. Mechanical lugs. Color-coded cam-lock connectors. Submit product data and dimensioned drawings. Color selection by Architect.

1. Portable Generator Cam Lock Receptacle: Male or female cable

C. Kirk Key Interlock: Provide a kirk key interlock between the permeant generator and the temporary generator disconnect.

D. Three-way Manual Transfer Switch: Provide-three-way switch to allow flexible connection between; onsite generator and load bank, portable generator and load, onsite generator and load.

E. Generator Start Signals: Provide parallel generator start cabling from the transfer switches to the portable generator cabinet. Provide quick connect type connections for the generator start signals.

F. Provide means to isolate permanent generator with temporary generator.

2.3 SERVICE CONDITIONS

A. Service Conditions: NEMA ICS 1. Suitable for use as service entrance equipment. Provide line side (service style) barriers.

2.4 RATINGS

A. Refer to the electrical diagrams for the Withstand and Close Ratings WCR available interrupting capacity (AIC) at the transfer switch. The transfer switch shall be series rated with the equipment feeding the transfer switch. The series rating shall be the larger of the two Short Circuit Current Ratings SCCR values when the SCCR rating of the equipment feeding the normal and emergency sides of the transfer switch is not equal.

B. Series rating with upstream devices shall be allowed per UL-1008.

2.5 AUTOMATIC SEQUENCE OF OPERATION

A. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.

B. Time Delay to Start Alternate Source Engine Generator: 0 to 10 seconds, adjustable.

C. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.

D. Time Delay Before Transfer to Alternate Power Source: 0 to 30 seconds, adjustable.

E. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.

F. Time Delay Before Transfer to Normal Power: 0 to 30 minutes, adjustable; bypass time delay in event of alternate source failure.

G. Time Delay Before Engine Shut Down: 0 to 30 minutes, adjustable, of unloaded operation.

2.6 ACCESSORIES

A. Indicating Lights: Mount in cover of enclosure to indicate NORMAL SOURCE AVAILABLE, ALTERNATE SOURCE AVAILABLE, SWITCH POSITION.

B. Test Switch: Key operated or password protected switch. Mount in cover of enclosure to simulate failure of normal source.

C. Engine Start Signal: Rated 10 amps at 30VDC shall be provided to start the engine generator in the event of a normal source outage.

D. Remote Start Circuit Monitoring: Provide continuous monitoring of the generator start circuits. A failure shall initiate visual and audible alarms at the generator, remote annunciators, and start the generator.

E. Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate to normal source.

F. Transfer Switch Auxiliary Contacts: 2 normally open; 2 normally closed indicating switch to normal source or emergency source.

G. Normal Source Monitor: Monitor each line of normal source voltage and frequency; initiate transfer when voltage drops below 85 percent or frequency varies more than 3 Hertz from rated nominal value, values shall be field adjustable.

H. Alternate Source Monitor: Monitor each line of alternate source voltage and frequency; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 percent Hertz from rated nominal voltage, values shall be field adjustable.

I. Engine Exerciser: Start engine every 7 days. Run for 30 minutes before shutting down. Each event shall be configurable for Test with Load or Test Without Load. Bypass exerciser control if normal source fails during exercising period.

J. In-Phase Monitor: Inhibit transfer until source and load are within 30 electrical degrees.

K. Provide 2 N.O. and 2 N.C. isolated contacts to indicate:

1. Normal source available.
2. Emergency source available.
3. Exercise mode in operation.

L. Serial Communication Port: Two twisted pairs of shielded communication cable in conduit shall daisy chain all transfer switches with a remote annunciator.

M. RA-ATS-1 Remote Annunciator: A remote annunciator shall be provided that shall monitor and control the following functions for each transfer switch:

1. Load Connect to Emergency/Normal Indication
2. Source Available: Emergency/Normal Indication
3. Time Delay Indication and Key Locked Bypass Switch
4. Transfer Test Indication and Key Locked Switch
5. Remote transfer loads between normal and emergency sources with Key Locked Switch
6. Remote generator start with Key Locked Switch
7. Remote generator stop with Key Locked Switch

N. Annunciators shall be located where shown on the drawings, as directed by the Owner. Extend conduit and wire as required by the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Verify field measurements are as instructed by the manufacturer.

C. Verify that required utilities are available, in proper location, and ready for use.

D. Beginning of installation means acceptance of existing conditions.

3.2 CONTROL AND SIGNAL CABLING

A. Provide control and signal cabling per manufacturer recommendations for the following systems components:

1. Remote annunciator.
2. Generator start signal. The generator start signal cabling for the following transfer switches shall be fire protected for a minimum of 2 hours using an approved method:

    a. Emergency, optional standby transfer switches
    b.
    c. Approved Methods:

        1) Raceway or cable encased in a minimum of 2 inches of concrete cover.
        2) Listed fire resistive raceway / cable system.
        3) Raceway / cable is protected by a listed electrical circuit protective system.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION 26 36 00

SECTION 26 43 00 - SURGE PROTECTION DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section describes materials and installation requirements for factory and field wired low voltage surge protection devices (SPD) for the protection of all AC electrical circuits. SPD equipment to be installed at designated service entrance equipment and distribution panels.

1.2 QUALITY ASSURANCE

A. The specified unit shall be designed, manufactured, tested and installed in compliance with the above references. The unit shall be "Listed by Underwriters Laboratories" to UL 1449.

B. Each unit shall be designed and manufactured by a qualified manufacturer of power conditioning equipment. The qualified manufacturer must have been engaged in the design and manufacturer of such products for a minimum of five years.

1.3 REFERENCES

A. ANSI/IEEE C62.33 - IEEE Guide on Testing of MOV components

B. ANSI/IEEE C62.35 - IEEE Guide on Testing of SAD components

C. ANSI/IEEE C62.41 - IEEE Recommended Practice on Surge Voltage in Low Voltage AC Power Circuits

D. ANSI/IEEE C62.45 - IEEE Guide on Surge Testing for Equipment Connected to Low Voltage AC Power Circuits

E. ANSI/UL 1449 Latest Edition - UL Standard for Safety for Surge Protective Devices

F. CBEMA - Computer Business Equipment Manufacturers Association

G. IEC 664 - International Engineering Consortium, Standard for Clamping Voltage

H. NFPA 70 - National Electrical Code (NEC)

I. UL 67 - Listed for Internal Panelboard Transient Voltage Surge Suppressors

J. UL 96A - Devices listed as approved for secondary surge arrestors (VZCA)

K. UL 248-1 - Fusing

L. UL 1283 - Electromagnetic Interference Filters, Fifth Edition

1.4 SUBMITTALS

A. Shop Drawings: Should include device dimensions, mounting requirements including wire size and over-current protection device rating, nameplate nomenclature, electrical ratings, short circuit current rating, and test results as indicated below under "Testing, Warranty and Life Expectancy" as provided by an independent test lab or a UL certified test lab for the category(ies) of suppression device(s) specified using the appropriate IEEE test wave. Product data sheets with installation instructions for each size and type of device are required. Shop drawings submitted without the testing data as required by section this section will be rejected.

B. Fuse information: Provide fuse information if required for operation. Include size, manufacturer, time-current chart responses to UL 1449 testing requirements, maximum surge protection capability per mode and phase as limited by the fuse, and verification of repetitive surge protection device operation without system degeneration greater than 10%.

1.5 SPARE PARTS

A. Surge Protection Modules: Furnish 1 replacement module for each type installed.

B. Fuses: Furnish to the Owner 3 spare fuses of each type and rating installed.

1.6 TESTING, WARRANTY AND LIFE EXPECTANCY

A. Manufacturer must provide independent testing on repetitive capability and maximum surge current rating of service entrance suppressor units. This shall be performed at a nationally recognized lab not affiliated with the manufacturer.

1. Single pulse surge current capacity: Single pulse surge current tested in a mode at rated surge currents.
2. Single pulse surge current capacity test: An initial UL 1449 defined 1.2 x 50µs, 6000V open circuit voltage waveform and an 8 x 20µs, 500A and 3kA short circuit current waveform shall be applied to benchmark the unit's suppression voltage (VPR).
3. A single 8 x 20µs waveform pulse of maximum rated surge current per mode shall then be applied. To complete the test, another UL 1449 surge shall be applied to verify the unit's survival. Survival is achieved if the suppression voltage measured from the two UL1449 surges does not vary by more than 10%.

B. Minimum Repetitive Surge Current Capacity:

1. Service entrance suppressor units should be tested repetitively at an independent lab to verify repetitive capacity.
2. Minimum Repetitive Surge Current Capacity Test:

    a. An initial UL 1449 surge defined as 1.2 x 50µs, 6000V open circuit voltage waveform and an 8 x 20µs, 500A and 3kA short circuit current waveform shall be applied to benchmark the unit's suppression voltage.

b. A repetitive number of ANSI/IEEE C62.41.2-2002 (Category C3) surges, defined as a 1.2 x 50µs 10kV or 20kV open circuit voltage waveform and an 8 x 20µs 10,000A short circuit current waveform, shall then be applied at one-minute intervals.
c. To complete the test, another UL 1449 surge shall be applied to verify the unit's survival.

3. Survival is achieved if the suppression voltage (VPR) does not vary by more than 10%.
4. Proof of such testing shall be the test log generated by the surge generator.

C. Provide UL 1449 classification white sheet pages indicating the VPR (voltage protection rating) for each SPD unit submitted for this product using the 6kV/3kA combination wave surge.

D. Warranty: Ten (10) years. Includes workmanship, installation and programming.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. General: The unit shall provide transient voltage suppression, surge current diversion and high-frequency noise attenuation, when connected in parallel to the facilities distribution system. The unit MCOV shall not be less than 115% of the nominal system voltage. Operating frequency shall be for a 60 Hz system. The unit shall provide protection in all normal modes for "wye" and "delta" systems.

B. Short Circuit Current Rating: Provide factory label for SCCR rating. The short circuit current rating shall be the larger of the listed value on the drawings or as required by the equipment protected.

2.2 RATINGS

A. SPD-1; Service Entrance Suppressors:

1. For 120/208-volt, 3 phase, 4 wire, type 2, category C3 unit.

a. Surge current capacity: 100,000/200,000 amps per protection mode/phase
b. Nominal Discharge Current: 20 kA.
c. Mounting: Voltage Protection Rating: Refer to requirements below.
d. Components: Minimum component size of 20mm thermally protected metal oxide varistors (MOV).
e. Disconnect: Surge-rated disconnect with 200,000 SCCR.

2. Manufacturers:

a. Square D Surgelogic EMA Series
b. Siemens TPS3 Series
c. Eaton SPD Series
d. Current Technology Current Guard Plus

e. ASCO Power Technologies 400 Series
f. LEA International LSS Series

B. SPD-2 Secondary Distribution Suppressors:

1. For 120/208-volt, 3 phase, 4 wire, type 2, category B3/C1 unit.

a. Surge current capacity: 60,000/120,000 amps per protection mode/phase
b. Nominal Discharge Current (IN): 20 kA.
c. Mounting:
d. Voltage Protection Rating: Refer to requirements below.
e. Components: Minimum component size of 20mm metal thermally protected oxide varistors (MOV).

2. Manufacturers:

a. Square D Surgelogic EMA Series
b. Siemens TPS3 Series
c. Eaton SPD Series
d. Current Technology Current Guard Plus
e. ASCO Power Technologies 400 Series
f. LEA International CFS Series

C. Voltage Protection Rating:

1. Protection modes and UL 1449 voltage protection rating for surge suppression units per each mode (L-N, L-L, L-G, and N-G as appropriate).

a. 120/208 Volt, 3 phase, 4 wire. 700 Volt L-N, N-G, 800 Volt L-G and 1200 Volt L-L

D. EMI/RFI Noise Rejection or Filtering:

1. Each unit shall include a UL1283 first order, high-frequency filter for noise filtering between 10 KHz and 100 MHz.

E. Indication:

1. Each unit shall include solid-state indicators with externally mounted LED visual status indicators that indicate on-line status of each protection mode of the unit.
2. Each unit shall include an audible alarm with silencing switch to indicate when protection has failed.
3. Provide each service entrance secondary distribution type unit(s) with a transient counter.
4. Each unit shall contain form "C" contacts for remote indication of an alarm status.

F. Fuses:

1. Use fuses recommended by the manufacturer to satisfy repetitive UL 1449 operation of the surge suppression unit.
2. Fuses shall be rated 200, 000 AIC minimum interrupting capacity.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine equipment for size and type of surge protection device to be used to ensure physical compatibility.

B. Inspect surge protection device for any signs of physical damage due to shipping or handling before installing surge protection device.

3.2 INSTALLATION

A. Mounting Location:

1. The unit shall be installed as close as practical to the panel secondary lugs in accordance with applicable national/Local Electrical Codes and the manufacturer's recommended installation instructions. Connect the unit to the or or panel using a conduit nipple. Flush mount the unit in the front of the switchboard. Mount unit directly across from the breaker or disconnect serving it.
2. If internal surge protection device is specified, device shall be installed in a barrier compartment isolated from other components.

B. Connections:

1. Conductors from the protected bus to the unit shall not be any longer than necessary avoiding unnecessary bends. The conductor leads shall be twisted together and as short as possible. Connection shall be with mechanical lugs for each phase, neutral, and ground if applicable. Contractor shall provide wire and circuit breakers sized per the approved manufacturer's requirements. Maximum lead length from protected bus to surge protection device shall be per manufacturer's requirements, but no greater than 5'-0".
2. The surge protection unit shall be isolatable from the electrical distribution system via 3 pole circuit breaker mounted in the panelboard. Single phase 120-volt units shall be hardwired without a disconnecting means.
3. |Neutral and ground shall not be bonded together at secondary panelboard locations.

C. General:

1. Check unit for proper operation of protection and indication under start-up.
2. Check unit to ensure all MOVs for each mode of protection are operational. Verify integral fuse links are operational and have not melted.
3. Surge suppression devices shall not be installed ahead of the main service disconnect(s).
4. Install fuses in all fuse holders and fused disconnects internal to the surge protection unit. Use fuses recommended by the manufacturer to satisfy repetitive UL 1449 operation of the surge suppression unit. External fusing of the surge protection device is not allowed.
5. Coordinate location of surge protection device to allow adequate clearances for maintenance.

END OF SECTION 26 43 00

SECTION 26 51 19 - LED LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires and accessories

B. Exterior luminaires and accessories

C. Light-emitting diode (LED) luminaire systems

D. LED emergency lighting units

E. Emergency exit signs

F. Lighting poles

1.2 RELATED SECTIONS

A. The lighting system design includes a combination of luminaire sources, lighting control components, programming sequences, and supplementary components for building and energy code compliance. The design uses performance-based specifications for portions of the lighting system to account for the limitation of comparable product solutions available by competitive manufacturers. The Contractor shall reference related specification sections, plans, schedules, and details prior to submitting pricing, submittals, and installation. The Contractor shall coordinate system component compatibility among various manufacturers and suppliers for a turnkey lighting system. Referenced sections include, but are not limited to, the following:

1. 26 09 33 Lighting Control Systems

    a. Automatic load control relay (ALCR) (individual luminaire - integral) (ALCR3)

2. Electrical drawings: Plans, luminaire schedules, lighting control sequence of operations, diagrams, and details.

1.3 REFERENCES

A. ANSI C78.377 - Specifications for the Chromaticity of Solid State Lighting Products

B. ANSI C82.16 - Light-Emitting Diode Drivers - Method of Measurement

C. ANSI C82.77 - Standard for Harmonic Emission Limits and Related Power Quality Requirements for Lighting Equipment

D. NFPA 70E - National Electrical Safety Code

E. NEMA SSL1 - Electronic Drivers for LED Devices, Arrays or System

F. UL 8750 - Light Emitting Diode (LED) Equipment for use in Lighting Products

G. LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

H. LM-80 - Measuring Luminous Flux and Color Maintenance of LED

I. FS W-L-305 - Light Set, General Illumination (Emergency or Auxiliary)

J. UL 924 - Standard for Emergency Lighting and Power Equipment

K. Project site classification as defined in IESNA RP-33 LZ2.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 26 05 00.

B. Basic Requirements of Submittal:

1. Submit product data sheets for luminaires, LED light engines, drivers and poles. Include complete product model number with all options as specified. Submittal shall be arranged with luminaires listed in ascending order, and with each luminaire's, LED light engine, driver, or pole information following luminaire's product data. Failure to organize submittal in this manner will result in the submittal being rejected.
2. Submit lens product data, dimensions and weights if not included in product data sheet submittal.
3. Include outline drawings, support points, weights, and accessory information for each luminaire.
4. Submit manufacturer origin of LED chipset and driver.

1.5 EXTRA STOCK

A. Provide extra stock under provisions of Section 26 05 00.

B. LED Light Engines or Modules: 3 percent of quantity installed, minimum one (1) of each size and type of field replaceable light engine or module. Provide field replacement installation instructions.

C. Lenses: Three (3) percent of quantity installed, minimum one (1) of each size and type.

D. LED Drivers: 3 percent of quantity installed, minimum one (1) of each size and type.

E. Exit Signs: Provide 3 additional exit sign luminaires complete with labor, conduit, and wire. Additional exit luminaires shall be located per the Architect/Engineer or provided as attic stock when a location is not defined prior to Owner occupancy. When multiple exit signs are scheduled, the quantity listed above shall represent each type listed.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site. Store and protect under provisions of Section 26 05 00.

B. Protect luminaire finishes, lenses, and trims from damage during storage and installation. Do not remove protective films until construction cleanup within each area is complete.

C. Handle site lighting poles carefully to prevent breakage and damage to finish.

1.7 WARRANTY

A. The warranty period begins at the date of Substantial Completion.

B. LED Light Engines and Drivers:
1. LED Drivers and Dimming Drivers: Five (5) years
2. Light Emitting Diode (LED) Light Engines: Five (5) years

C. Emergency Lighting Units and Exit Signs:

1. Emergency Lighting Units: Three (3) year, non-prorated
2. Exit Signs: Three (3) year, non-prorated
3. Emergency Unit and Exit Sign Battery: Sealed lead acid or lead calcium cell, requiring no maintenance or replacement for ten (10) years under normal conditions.

D. Automatic Load Control Relay (ALCR): Five (5) year

E. Pole Finish: Three (3) year warranty of pole color and finish

1.8 REGULATORY REQUIREMENTS

A. Conform to NFPA 101 for installation requirements

PART 2 - PRODUCTS

2.1 INTERIOR LUMINAIRES AND ACCESSORIES - GENERAL

A. Lensed Troffers: Provide hinged frames with latches and 0.125-inch thick virgin acrylic lenses. Prismatic lenses shall have depth of no less than 0.080", KSH12 or equal. Other lenses as scheduled.

B. Recessed Luminaires: Confirm ceiling and wall type and furnish trim and accessories necessary to permit proper installation in each system. Where fire-rated ceiling or wall assemblies are specified, furnish and install listed enclosures around luminaires that maintain the system rating.

C. Luminaires: Louvers shall be anodized low iridescent specular aluminum with mitered corners and interlocking construction.

D. Suspended Luminaires: Coordinate power feed and suspension canopies with ceiling type and architectural RCP for proper fit and location. Ensure finished installations are plumb and level at elevations specified. Verify suspension length prior to submittal.

E. Painted reflector surfaces shall have a minimum reflectance of 90%.

F. All painted components shall be painted after fabrication.

2.2 EXTERIOR LUMINAIRES AND ACCESSORIES - GENERAL

A. Listed for wet or damp location as scheduled. Provide ingress protection (IP) rating when scheduled.

B. Provide low temperature LED drivers, with reliable starting to -20°F.

C. In-grade luminaires shall have lamp/optic separation to prevent surface temperature from exceeding 115°F. Compartment separation of wire entry and control gear/lamp chamber.

D. Exterior LED luminaires shall contain separate, easily accessible and replaceable Category C surge protection device.

2.3 LIGHT EMITTING DIODE (LED) LUMINAIRE SYSTEMS

A. Refer to the luminaire schedule for color temperature and minimum color rendering index CRI requirements.

B. Rated life shall be minimum of 50,000 hours at L70.

C. LED chips shall be wired so that failure of one chip does not prohibit operation of the remainder of the chip array.

D. Luminaire delivered lumens is defined as the absolute lumens per the manufacturers LM-79-08 test report.

E. LED luminaires shall be designed for ease of component replacement including modular replaceable boards or Zhaga sockets. Luminaires that are factory sealed and do not have field replaceable parts shall provide a 10-year warranty.

F. LED light engine shall have a maximum LLD of 0.85 at 50,000 hours at 25°C ambient.

G. LED Driver:

1. Solid state driver with integral heat sink. Driver shall have over-heat, short-circuit and overload protection, power factor 0.90 or above and maximum total harmonic distortion of 20%. Driver shall have a voltage fluctuation tolerance of +/- 10%.
2. Drivers shall have dimming capabilities as outlined in the luminaire schedule for each luminaire type. Dimming shall control light output in a continuous curve from 100% to 10% unless noted otherwise.
3. Driver shall have a minimum of 50,000 hours rated life.
4. Driver shall be tested to ANSI C82-16 for input current inrush, total harmonic distortion (THD), and power factor. Driver start time shall be less than 0.5 seconds to 98% of initial light output. Flicker should be less than 30% throughout the operating range.
5. Driver shall be field replaceable without removal of the luminaire.
6. Class A sound rating; inaudible in a 27 dBA ambient.

7. Demonstrate no visible change in light output with a variation of plus or minus 10 percent change in line-voltage input.

2.4 EMERGENCY EXIT SIGNS

A. Self-Powered Exit Signs: Stencil face, 6-inch high letters, directional arrows as indicated, universal mounting type as indicated on the drawings. One-piece, self-contained unit with sealed, maintenance-free nickel cadmium battery, test switch, AC ON pilot light, automatic charger, and electronic circuitry. Power failure relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

B. Directional Indicators: The directional indicator for exit signage shall be of a chevron type meeting all requirements of NFPA 101.

C. Self-Diagnostics and Testing:

1. Unit shall be self-diagnostic with continuous monitoring of charger performance and battery voltage. Any malfunction of battery, charger, transfer circuit, or emergency lamps shall be detected and visually indicated.
2. Unit shall be programmed to exercise the battery and test emergency operation by performing a five-minute discharge/diagnostic cycle every six months. A manual test switch shall allow a five minute discharge/diagnostic test at any time.

2.5 LIGHTING POLES

A. Manufacturers:

1. Manufacturer of luminaire (metallic pole)
2. Valmont Poles (metallic pole)
3. U.S. Pole Company (metallic pole)
4. KW Industries (metallic pole)

B. Metal Poles: Round tapered aluminum lighting pole with embedded base.

1. Painted steel poles shall have electrostatic applied polyester powder coated paint finish thermally cured with UV protection. Interior of pole shall be coated with same coating for a minimum of 12" from base plate.
2. Galvanized steel hot dipped finish to standard AASHTO M 111.
3. Anodized aluminum finish to MIL-A-8625 Type II, minimum 0.8 mil thickness. Provide anodized color sample to Architect/Engineer prior to ordering.

C. Wind Load: 100 MPH velocity, with 1.14 percent three-second gust factor with luminaires and brackets mounted.

D. Hand Hole: 2 x 4 inches with removable weatherproof cover installed at manufacturer's standard location. Provide matching gasketed cover plate.

E. Pole Top: Provide mast arm(s) in array as indicated.

F. Anchor Bolts: As recommended by pole manufacturer. Provide template, flat washers, lock washers, and hex nuts for each pole. Grout between anchor plate and concrete base with non-shrink grout after pole is plumbed.

G. Vibration Damper: Canister or snake type second mode vibration damper internal to the metal pole as recommended by pole manufacturer. Provide additional pole top damper for first mode vibration on single-head metal poles where recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Securely fasten luminaires to the listed and labeled ceiling framing member by mechanical means such as bolts, screws, rivets or listed clips identified for use with the type of ceiling framing members. The architectural ceiling framing system may be used in lieu of independent support with prior written approval by the ceiling system manufacturer and Authority Having Jurisdiction (AHJ). Luminaires and wiring installed in fire-rated ceiling assemblies shall be independently supported for all applications.

1. Install recessed flanged luminaires to permit removal from below. Use manufacturer-supplied plaster frames and swing gate supports. Provide independent support as follows:

    a. Luminaires less than 56 lbs: Provide a minimum of two (2) #12 gauge suspended ceiling support wires located on diagonal corners of the luminaires.
    b. Luminaires 56 lbs or greater: Provide a minimum of four (4) #12 gauge suspended ceiling support wires located on diagonal corners of the luminaires. Support luminaire independent of the ceiling system.
    c. Luminaires larger than eight square feet (8 ft2): Support luminaire independent of the ceiling system.

B. Do not fasten luminaire supports to piping, ductwork, mechanical equipment, or conduit, unless otherwise noted. Support wires shall be tightly wrapped (minimum of three turns within 3 inches of the connection) and sharply bend to prevent vertical movement.

C. Support suspended or pendant mounted luminaires independent of ceiling grid with adjustable stainless steel aircraft cables or per luminaire schedule mounting requirements. Suspension assembly and anchors shall be capable of supporting 300 pounds dead load at each suspension point.

D. Support wire used to independently support luminaires, raceways, and wiring systems shall be distinguishable from ceiling support systems by color (field paint), tagging or equivalent means.

E. Provide seismic bracing of luminaires per IBC Chapter 16. Design pendant luminaires on a component seismic coefficient (Cc) of 0.67. Design vertical supports with a factor of safety of 4.0. Contractor shall verify the Seismic Hazard Exposure Group and Performance Criteria Factor.

F. Install lamps in lamp holders of luminaires.

G. Adjust aimable luminaires to obtain lighting levels on objects and areas as directed to obtain desired lighting levels.

H. Recessed luminaires and other optical accessories shall remain in protective wraps or films until construction in area is complete and area has been cleaned.

I. Industrial Pendant Luminaires: Use power hook hangers rated 500 pounds minimum or provide safety chain between driver and structure. Provide safety chain between reflector and driver.

J. Luminaire Pole Bases: Sized and constructed as indicated on the drawings. Project anchor bolts 2 inches minimum above base. Install poles plumb with double nuts for adjustment. Grout around pole anchor base.

K. Embedded Luminaire Poles: Depth as indicated. Install plumb.

L. Use belt slings or non-chafing ropes to raise and set pre-finished luminaire poles.

3.2 CONSTRUCTION USE OF PROJECT LUMINAIRES

A. The Contractor shall provide temporary construction lighting per the requirements of Division 1.

B. The project luminaires shown on the construction documents shall not be used for temporary construction purposes without providing a plan for Owner approval that addresses energy and luminaire operating hours.

3.3 AUTOMATIC LOAD CONTROL RELAYS

A. Factory or field installation per manufacturer requirements.

B. Remote Test Switch: Provide connection to remote test switch.

C. Fire Alarm Override: Provide connection to addressable fire alarm relay.

3.4 EMERGENCY LIGHTING UNITS AND EXIT SIGNS

A. Install units plumb and level.

B. Aim directional lamp heads as directed.

C. Test emergency lighting equipment for 60 minutes to determine proper operation, prior to Substantial Completion. Provide electronic copy of periodic test log form to Owner's Representative. Explain and instruct Owner's Representative of requirements for testing and maintenance. Refer to latest adopted NFPA 101 for testing and logging requirements.

3.5 RELAMPING

A. Replace failed LED light engine modules or arrays at completion of work.

3.6 ADJUSTING AND CLEANING

A. Align luminaires and clean lenses and diffusers at completion of work. Clean paint splatters, dirt, and debris from installed luminaires.

B. Touch up luminaire and pole finish at completion of work.

3.7 LUMINAIRE SCHEDULE

A. As shown on the drawings.

END OF SECTION 26 51 19

SECTION 27 05 00 - BASIC COMMUNICATIONS SYSTEMS REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Basic Communications Systems Requirements specifically applicable to Division 27 sections, in addition to Division 1 - General Requirements.

B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

1.2 SCOPE OF WORK

A. This Specification and the associated drawings govern furnishing, installing, testing and placing into satisfactory operation the Communications Systems.

B. The Contractor shall furnish and install all new materials as indicated on the drawings, and/or in these specifications, and all items required to make the portion of the Communications Work a finished and working system.

C. Separate contracts will be awarded for the following work.

D. All work will be awarded under a single General Contract. The division of work listed below is for the Contractor's convenience and lists normal breakdown of the work.

E. Separate contracts will be awarded for the following work. The division of work listed below is for the contractors' convenience and lists a normal breakdown of the work. Please refer to the Construction Manager's scope statements for complete scope of work description.

F. Description of Systems include, but are not limited to, the following:

1. Complete Structured Cabling System including, but not limited to:

    a. Voice and data backbone cabling and terminations.
    b. Voice and data horizontal cabling and terminations.
    c. Information outlets (IOs) including faceplates, jacks and labeling.
    d. Equipment racks, cabinets, cable management and equipment.
    e. Telecommunication Room equipment including patch panels, optical distribution cabinets, and termination blocks.
    f. Cabling pathways.
    g. Grounding and Bonding
    h. Testing

2. Mounting and patching of wireless access points provided by others.
3. Removal/demolition work and/or relocation and reuse of existing systems and equipment.
4. Low Voltage Communications Wiring (less than +120VAC) as specified and required for proper system control and communications.

5. All associated electrical backboxes, conduit, miscellaneous cabling, and power supplies required for proper system installation and operation as defined in the "Suggested Matrix of Scope Responsibility".
6. Firestopping of penetrations as described in Division 7.
7. Seismic requirements as described in Section 26 05 48 "Seismic Requirements for Equipment and Supports".

1.3 OWNER FURNISHED PRODUCTS

A. Active network hardware, switches, routers , etc.

B. Wireless access points.

1.4 WORK SEQUENCE

A. All construction work that will produce excessive noise levels and interference with normal building operations, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during non-occupied hours. The Owner shall reserve the right to set policy as to when restricted construction hours will be required.

B. Itemize all work and list associated hours and pay scale for each item.

1.5 ALTERNATES

A. Insert.

1.6 DIVISION OF WORK BETWEEN ELECTRICAL AND COMMUNICATIONS CONTRACTORS

A. Division of work is the responsibility of the Prime Contractor. Any scope of work described in the contract document shall be sufficient for including said requirement in the project. The Prime Contractor shall be solely responsible for determining the appropriate subcontractor for the described scope. In no case shall the project be assessed an additional cost for scope that is described in the contract documents. The following division of responsibility is a guideline based on typical industry practice.

B. Definitions:

1. "Electrical Contractor" as referred to herein refers to the Contractors listed in Division 26 of this Specification.
2. "Electrical Contractor" shall also refer to the Contractor listed in Division 27 of this specification when the "Suggested Matrix of Scope Responsibility" indicates the work shall be provided by the EC. Refer to the Contract Documents for the "Suggested Matrix of Scope Responsibility".
3. "Technology Contractor" as referred to herein refers to the Contractors listed in Division 27 of this Specification.
4. Low Voltage Technology Wiring: The wiring (less than 120VAC) associated with the Technology Systems, used for analog and/or digital signals between equipment.

5. Telecommunications/Technology Rough-in: Relates specifically to the backboxes, necessary plaster rings and other miscellaneous hardware required for the installation and mounting of the telecommunications/technology outlet. Rough-in shall include conduit from the information outlet backbox to above the lay-in ceiling. Where surface mounted backboxes are required, conduit shall be routed to above the lay-in ceiling.

C. General:

1. The purpose of these specifications is to outline typical Electrical and Technology Contractor's work responsibilities as related to technology systems including telecommunications rough-in, audio/visual systems rough-in, conduit, power wiring, and low voltage communications and technology wiring. The prime contractor is responsible for all divisions of work.
2. The exact wiring requirements for much of the equipment cannot be determined until the systems have been purchased and submittals are approved. Therefore, only known wiring, conduits, raceways, and electrical power as related to such items, is shown on the technology drawings. Other wiring, conduits, raceways, junction boxes, and electrical power not shown on the technology drawings but required for the successful operation of the systems shall be the responsibility of the Technology Contractor and included in the Contractor's bid.
3. Where the Electrical Contractor is required to install conduit, conduit sleeves and/or power connections in support of technology systems, the final installation shall not begin until a coordination meeting between the Electrical Contractor and the Technology Contractor has convened to determine the exact location and requirements of the installation.
4. Where the Electrical Contractor is required to install cable tray that will contain low voltage technology wiring, the installation shall not begin until the Technology Contractor has completed a coordination review of the cable tray shop drawing.
5. This Contractor shall establish electrical and technology utility elevations prior to fabrication and installation. The Technology Contractor shall cooperate with the Electrical Contractor and the determined elevations in accordance with the guidelines below. This Contractor shall coordinate utility elevations with other trades. When a conflict arises, priority shall be as follows:

    a. Lighting Fixtures
    b. Gravity Flow Piping, including Steam and Condensate
    c. Sheet Metal
    d. Electrical Busduct
    e. Sprinkler Piping and other Piping
    f. Conduit and Wireway
    g. Open Cabling

D. Electrical Contractor's Responsibility:

1. Assumes all responsibility for all required conduit and power connections when shown on the "Suggested Matrix of Scope Responsibility" to be provided by the Electrical Contractor.
2. Assumes all responsibility for providing and installing cable tray.
3. Responsible for Communications Systems grounding and bonding.

4. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

E. Technology Contractor's Responsibility:

1. Assumes all responsibility for the low voltage technology wiring of all systems, including cable support where open cable is specified.
2. Assumes all responsibility for all required backboxes, conduit and power connections not specifically shown as being provided by the Electrical Contractor on the "Suggested Matrix of Scope Responsibility."
3. Assumes all responsibility for providing and installing all ladder rack and other cable management hardware (as defined herein).
4. Responsible for providing the Electrical Contractor with the required grounding lugs or other hardware for each piece of technology equipment which is required to be bonded to the technology bonding system.
5. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

1.7 COORDINATION DRAWINGS

A. Definitions:

1. Coordination Drawings: A compilation of the pertinent layout and system drawings that show the sizes and locations, including elevations, of system components and required access areas to ensure that no two objects will occupy the same space.

a. Mechanical trades shall include, but are not limited to, mechanical equipment, ductwork, fire protection systems, plumbing piping, medical gas systems, hydronic piping, steam and steam condensate piping, and any item that may impact coordination with other disciplines.
b. Electrical trades shall include, but are not limited to, electrical equipment, conduit 1.5" and larger, conduit racks, cable trays, pull boxes, transformers, raceway, busway, lighting, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
c. Technology trades shall include, but are not limited to, technology equipment, racks, conduit 1.5" and larger, conduit racks, cable trays, ladder rack, pull boxes, raceway, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
d. Maintenance clearances and code-required dedicated space shall be included.
e. The coordination drawings shall include all underground, underfloor, in-floor, in chase, and vertical trade items.

2. Spaces with open/cloud ceiling architecture shall indicate the overhead utilities and locate equipment as required to maintain clearance above lights. The intent for the installation is to maintain a maximum allowable vertical clearance and an organized/clean manner in the horizontal. Notify Architect/Engineer of the maximum clearance which can be maintained. Failure to comply will result in modifications with no cost to Owner.

    a. In cloud ceiling architecture, when open cabling/wire and/or cable tray crosses gaps between ceiling clouds and/or walls, cabling is to transition to conduits to span the gaps in order to conceal cabling from below.

3. The contractors shall use the coordination process to identify the proper sequence of installation of all utilities above ceilings and in other congested areas, to ensure an orderly and coordinated end result, and to provide adequate access for service and maintenance.

B. Participation:

1. The contractors and subcontractors responsible for work defined above shall participate in the coordination drawing process.
2. One contractor shall be designated as the Coordinating Contractor for purposes of preparing a complete set of composite electronic CAD coordination drawings that include all applicable trades, and for coordinating the activities related to this process. The Coordinating Contractor for this project shall be the Mechanical Contractor.

    a. The Coordinating Contractor shall utilize personnel familiar with requirements of this project and skilled as draftspersons/CAD operators, competent to prepare the required coordination drawings.

3. Electronic CAD drawings shall be submitted to the Coordinating Contractor for addition of work by other trades. IMEG will provide electronic file copies of applicable drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by IMEG. IMEG will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings.

C. Drawing Requirements:

1. The file format and file naming convention shall be coordinated with and agreed to by all contractors participating in the coordination process and the Owner.

    a. Scale of drawings:

        1) General plans: 1/4 Inch = 1'-0" (minimum).
        2) Mechanical, electrical, communication rooms, and including the surrounding areas within 10 feet: 1/2 Inch = 1'-0" (minimum).
        3) Shafts and risers: 1/2 Inch = 1'-0" (minimum).
        4) Sections of shafts and mechanical and electrical equipment rooms: 1/4 Inch = 1'-0" (minimum).
        5) Sections of congested areas: 1/2 Inch = 1'-0" (minimum).

2. Ductwork layout drawings shall be the baseline system for other components. Ductwork layout drawings shall be modified to accommodate other components as the coordination process progresses.
3. There may be more drawings required for risers, top and bottom levels of mechanical rooms, and shafts.
4. The minimum quantity of drawings will be established at the first coordination meeting and sent to the A/E for review. Additional drawings may be required if other areas of congestion are discovered during the coordination process.

D. General:

1. Coordination drawing files shall be made available to the A/E and Owner's Representative. The A/E will only review identified conflicts and give an opinion, but will not perform as a coordinator.
2. A plotted set of coordination drawings shall be available at the project site.
3. Coordination drawings are not shop drawings and shall not be submitted as such.
4. The contract drawings are schematic in nature and do not show every fitting and appurtenance for each utility. Each contractor is expected to have included in his/her bid sufficient fittings, material, and labor to allow for adjustments in routing of utilities made necessary by the coordination process and to provide a complete and functional system.
5. The contractors will not be allowed additional costs or time extensions due to participation in the coordination process.
6. The contractors will not be allowed additional costs or time extensions for additional fittings, reroutings or changes of duct size, that are essentially equivalent sizes to those shown on the drawings and determined necessary through the coordination process.
7. The A/E reserves the right to determine space priority of equipment in the event of spatial conflicts or interference between equipment, piping, conduit, ducts, and equipment provided by the trades.
8. Changes to the contract documents that are necessary for systems installation and coordination shall be brought to the attention of the A/E.
9. Access panels shall preferably occur only in gypsum board walls or plaster ceilings where indicated on the drawings.

    a. Access to mechanical, electrical, technology, and other items located above the ceiling shall be through accessible lay-in ceiling tile areas.
    b. Potential layout changes shall be made to avoid additional access panels.
    c. Additional access panels shall not be allowed without written approval from the A/E at the coordination drawing stage.
    d. Providing additional access panels shall be considered after other alternatives are reviewed and discarded by the A/E and the Owner's Representative.
    e. When additional access panels are required, they shall be provided without additional cost to the Owner.

10. Complete the coordination drawing process and obtain signoff of the drawings by all contractors prior to installing any of the components.

11. Conflicts that result after the coordination drawings are signed off shall be the responsibility of the contractor or subcontractor who did not properly identify their work requirements, or installed their work without proper coordination.
12. Updated coordination drawings that reflect as-built conditions may be used as record documents.

1.8 QUALITY ASSURANCE

A. Telecommunications Structured Cabling System Standards:

1. All work and equipment shall conform to the most current ratified version of the following published standards unless otherwise indicated that draft standards are to be followed:

a. ANSI/NECA/BICSI 568 - Standard for Installing Commercial Building Telecommunications Cabling
b. ANSI/TIA-568-C.0 - Generic Telecommunications Cabling for Customer Premises

1) C.1 - Commercial Building Telecommunications Standard
2) C.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standard
3) C.3 - Optical Fiber Cabling Components Standard
4) C.4 - Broadband Coaxial Cabling and Components Standard

c. ANSI/TIA-569-C - Telecommunications Pathways and Spaces
d. ANSI/TIA-607-B - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
e. ANSI/TIA-862-A - Building Automation Systems Cabling Standard
f. ANSI/TIA-1152 - Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
g. ANSI/TIA/EIA-598-C - Optical Fiber Cable Color Coding
h. NFPA 70 (NEC) - National Electrical Code (Current Edition)
i. UL 444 - Standard for Safety for Communications Cable

B. Refer to individual sections for additional Quality Assurance requirements.

C. Qualifications:

1. Only products of reputable manufacturers as determined by the Architect/Engineer will be acceptable.
2. The installing Contractor shall be certified by the manufacturer of the structured cabling system. Certification of Contractor shall have been in place for a minimum of one (1) year prior to bidding this project. Documentation of certification is required at the time of bid. Shop drawings will not be approved until proof of certification is submitted. Refer to the end of this specification section for certification documentation requirements.
3. Each Contractor and their subcontractors shall employ only workers who are skilled in their respective trades and fully trained. All workers involved in the termination of cabling shall be individually certified by the manufacturer.

4. The Contractor shall be experienced in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size.
5. The Contractor shall own and maintain tools and equipment necessary for successful installation and testing of optical and copper structured cabling systems and have personnel adequately trained in the use of such tools and equipment.
6. The Contractor must have a BICSI RCDD (Registered Communications Distribution Designer) or CNet CNIDP (Certified Network Infrastructure Design Professional) on-staff serving as a project manager. Project shop drawings and test reports shall be stamped by the RCDD or CNIDP.
7. The Contractor shall obtain the services of a BICSI RCDD (Registered Communications Distribution Designer) or CNet CNIDP (Certified Network Infrastructure Design Professional) for the project. The RCDD or CNIDP shall perform the following tasks on the project:

    a. Review contractor's submittals and stamp the submittals stating the submittals compliance with the contract documents.
    b. Provide written and dated confirmation of an observation of the contractor's installation activities no less than every 2 weeks during the construction period.
    c. Provide a final written and dated confirmation of a final construction review prior to testing.
    d. Review final testing of system and indication that the documented results or transmittal of the results stating the test results compliance with the contract documents.

8. The Contractor shall have certified BICSI installation technicians or CNet CNIT (Certified Network Infrastructure Technician) on staff to perform the following tasks on the project:

    a. Act as the field superintendent or job foreman with the responsibility of monitoring the daily work of each technician.
    b. Oversee all testing and termination of cabling.

9. The Contractor shall have certified BICSI Installer 2 or CNet CNCI (Certified Network Cabling Installer) on staff to perform the following tasks:

    a. Installation and termination of copper cable.
    b. Installation and termination of optical fiber.

10. A resume of qualification shall be submitted with the Contractor's bid indicating the following:

    a. Documentation of certification of This Contractor by the proposed structured cabling system manufacturer as required at the end of this specification section.
    b. A list of recently completed projects of similar type and size with contact names and telephone numbers for each.
    c. A list of test equipment proposed for use in verifying the installed integrity of copper and fiber optic systems on the project.

d. A technical resume of experience for the Contractor's project manager and on-site installation supervisor assigned to this project.
e. Resume and certification of the RCDD or CNIDP for the project as required by the form at the end of this specification section.
f. Resume and certification of the BICSI installation technician or CNet CNIT for the project.

D. Compliance with Codes, Laws, Ordinances:

1. Conform to all requirements of the City of Caseyville, Illinois Codes, Laws, Ordinances and other regulations having jurisdiction.
2. In the event there are no local codes having jurisdiction over this job, the current issue of the National Electrical Code shall be followed.
3. If there is a discrepancy between the codes and regulations having jurisdiction over this installation, and these specifications, Architect/Engineer shall determine the method or equipment used.
4. If the Contractor notes, at the time of bidding, any parts of the drawings and specifications which are not in accordance with the applicable codes or regulations, he shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time to follow this procedure, he shall submit with the proposal, a separate price required to make the system shown on the drawings comply with the codes and regulations.
5. Verify the installation environment prior to purchasing or installing any cable. Cable installed in a plenum environment shall be appropriately rated. Bring all discrepancies between the contract documents and installation conditions to the attention of the Architect/Engineer prior to purchase or installation.
6. All changes to the system made after the letting of the contract, in order to comply with the applicable codes or the requirements of the Inspector, shall be made by the Contractor without cost to the Owner.

E. Permits, Fees, Taxes, Inspections:

1. Procure all applicable permits and licenses.
2. Abide by all applicable laws, regulations, ordinances, and other rules of the State or Political Subdivision wherein the work is done, or as required by any duly constituted public authority.
3. Pay all applicable charges for such permits or licenses that may be required.
4. Pay all applicable fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
5. Pay all charges arising out of required inspections due to codes, permits, licenses or as otherwise may be required by an authorized body.
6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized independent agency/consultant.
7. Pay any charges by the service provider related to the service or change in service to the project.
8. All equipment and materials shall be as approved or listed by the following (unless approval or listing is not applicable to an item by all acceptable manufacturers):

a. Factory Mutual
b. Underwriters' Laboratories, Inc.

F. Service Provider Requirements:

1. Secure from the telecommunications service provider all applicable requirements.
2. Comply with all service provider requirements.
3. The Owner shall make application for and pay for new telecommunications service equipment and installation. The Contractor shall coordinate schedule and requirements with the Owner and service provider.

G. Examination of Drawings:

1. The drawings for the technology systems work are diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and the exact routing of cabling to best fit the layout of the job. Scaling of the drawings will not be sufficient or accurate for determining this layout. Where a specific route is required, such route will be indicated on the drawings.
3. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
4. If an item is either shown on the drawings, called for in the specifications or required for proper operation of the system, it shall be considered sufficient for including same in this contract.
5. The determination of quantities of material and equipment required shall be made by the Contractor from the drawings. Schedules on the drawings and in the specifications are completed as an aid to the Contractor but where discrepancies arise, the greater number shall govern.
6. Where words "provide", "install", or "furnish" are used on the drawings or in the specifications, it shall be taken to mean, to furnish, install and terminate completely ready for operation, the items mentioned.

H. Electronic Media/Files:

1. Construction drawings for this project have been prepared utilizing Revit.
2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by IMEG. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.
4. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
5. The drawings prepared by IMEG for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.
6. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.

7. The information is provided to expedite the project and assist the Contractor with no guarantee by IMEG as to the accuracy or correctness of the information provided. IMEG accepts no responsibility or liability for the Contractor's use of these documents.

I. Field Measurements:

1. Before ordering any materials, this Contractor shall verify all pertinent dimensions at the job site and be responsible for their accuracy.
2. Field conditions that will result in telecommunications drops that exceed the length limitations identified in the contract documents shall be brought to the attention of the Architect/Engineer prior to installation. The cost of reworking cabling that is too long, that was not brought to the written attention of the Architect/Engineer will be borne entirely by the Contractor.
3. This Contractor shall provide the Architect/Engineer with written documentation of any cabling drops that will not be able to use the cable tray (where cable tray is available) due to the resulting cabling lengths. This documentation shall be submitted prior to installation and installation shall not commence until approved by the Architect/Engineer.

1.9 SUBMITTALS

A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

1. Submittals list:

Referenced Specification Section	Submittal Item	Coordination Drawings
27 05 26	Communications Bonding	
27 05 28	Interior Communications Pathways	Yes
27 05 53	Identification and Administration	
27 11 00	Communication Equipment Rooms	Yes
27 13 00	Backbone Cabling Requirements	
27 15 00	Horizontal Cabling Requirements	
27 17 10	Testing	
27 51 13	Paging System	Yes

Referenced Specification Section	Submittal Item	Coordination Drawings

B. General Submittal Procedures: In addition to the provisions of Division 1, the following are required:

1. Transmittal: Each transmittal shall include the following:

   a. Date
   b. Project title and number
   c. Contractor's name and address
   d. Description of items submitted and relevant specification number
   e. Notations of deviations from the contract documents
   f. Other pertinent data

2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:

   a. Date
   b. Project title and number
   c. Architect/Engineer
   d. Contractor and subcontractors' names and addresses
   e. Supplier and manufacturer's names and addresses
   f. Description of item submitted (using project nomenclature) and relevant specification number
   g. Notations of deviations from the contract documents
   h. Other pertinent data
   i. Provide space for Contractor's review stamps

3. Composition:

   a. Submittals shall be submitted using specification sections and the project nomenclature for each item.
   b. Individual submittal packages shall be prepared for items in each specification section. All items within a single specification section shall be packaged together where possible. An individual submittal may contain items from multiple specifications sections if the items are intimately linked (e.g., pumps and motors).
   c. All sets shall contain an index of the items enclosed with a general topic description on the cover.

4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; wiring and control diagrams; dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.

5. Contractor's Approval Stamp:

    a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
    b. Unstamped submittals will be rejected.
    c. The Contractor shall provide proof of RCDD or CNIDP review on the submittal.
    d. The Contractor's review shall include, but not be limited to, verification of the following:

        1) Only approved manufacturers are used.
        2) Addenda items have been incorporated.
        3) Catalog numbers and options match those specified.
        4) Performance data matches that specified.
        5) Electrical characteristics and loads match those specified.
        6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
        7) Dimensions and service clearances are suitable for the intended location.
        8) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
        9) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).

    e. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.
    f. The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.

6. Submittal Identification and Markings:

    a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
    b. The Contractor shall clearly indicate the size, finish, material, etc.
    c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
    d. All marks and identifications on the submittals shall be unambiguous.

7. Schedule submittals to expedite the project. Coordinate submission of related items.
8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.
9. Reproduction of contract documents alone is not acceptable for submittals.

10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Architect/Engineer.
11. Submittals not required by the contract documents may be returned without review.
12. The Architect/Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Architect/Engineer to recheck and handle the additional shop drawing submittals.
13. Submittals shall be reviewed and approved by the Architect/Engineer before releasing any equipment for manufacture or shipment.
14. Contractor's responsibility for errors, omissions or deviation from the contract documents in submittals is not relieved by the Architect/Engineer's approval.
15. Schedule shall allow for adequate time to perform orderly and proper review of submittals, including time for consultants and Owner if required, and resubmittals by Contractor if necessary, and to cause no delay in Work or in activities of Owner or other contractors.

    a. Allow at least two weeks for Architect's/Engineer's review and processing of each submittal.

16. Architect/Engineer reserves the right to withhold action on a submittal which, in the Architect/Engineer's opinion, requires coordination with other submittals until related submittals are received. The Architect/Engineer will notify the Contractor, in writing, when they exercise this right.

C. Electronic Submittal Procedures:

1. Distribution: Email submittals as attachments to all parties designated by the Architect/Engineer, unless a web-based submittal program is used.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. Submittal file name: 27 XX XX.description.YYYYMMDD
    b. Transmittal file name: 27 XX XX.description.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.

D. Paper Copy Submittal Procedures:

1. Paper copies are acceptable where electronic copies are not provided.
2. The Contractor shall submit ten (10) paper copies of each shop drawing.

3. Each set shall be bound in a three-ring binder or presentation binder. Copies that are loose or in pocket folders are not acceptable.

1.10 SCHEDULE OF VALUES

A. The requirements herein are in addition to the provisions of Division 1.

B. Format:

1. Use AIA Document Continuation Sheets G703 or another similar form approved by the Owner and Architect/Engineer.
2. Submit in Excel format.
3. Support values given with substantiating data.

C. Preparation:

1. Itemize work required by each specification section and list all providers. All work provided by subcontractors and major suppliers shall be listed on the Schedule of Values. List each subcontractor and supplier by company name.
2. Break down all costs into:

    a. Material: Delivered cost of product with taxes paid.
    b. Labor: Labor cost, excluding overhead and profit.

3. Itemize the cost for each of the following:

    a. Overhead and profit.
    b. Bonds.
    c. Insurance.
    d. General Requirements: Itemize all requirements.

4. For each line item having an installed cost of more than $5,000, break down costs to list major products or operations under each item. At a minimum, provide material and labor cost line items for the following:

    a. Structured cabling
    b. Intercom systems
    c. Security systems

        1) Surveillance
        2) Access control
        3) Intrusion

D. Update Schedule of Values when:

1. Indicated by Architect/Engineer.
2. Change of Subcontractor or supplier occurs.
3. Change of product or equipment occurs.

1.11 CHANGE ORDERS

A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders shall be broken down by sheet or associated individual line item indicated in the change associated narrative, whichever provides the most detailed breakdown. Change orders with inadequate breakdown will be rejected.

B. Itemized pricing with unit cost shall be provided from all distributors and associated subcontractors.

C. Change order work shall not proceed until authorized.

1.12 EQUIPMENT SUPPLIERS' INSPECTION

A. The following equipment shall not be placed in operation until a representative of the manufacturer has inspected the installation and certified that the equipment is properly installed and that the equipment is ready for operation:

1. Firestopping, including mechanical firestop systems.

1.13 PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE

A. Exercise care in transporting and handling to prevent damage to fixtures, equipment and materials.

B. Store materials on the site to prevent damage.

C. Keep fixtures, equipment and materials clean, dry and free from deleterious conditions.

1.14 NETWORK / INTERNET CONNECTED EQUIPMENT

A. These specifications may require certain equipment or systems to have network, Internet and/or remote access capability ("Network Capability"). Any requirement for Network Capability shall be interpreted only as a functional capability and is not to be construed as authority to connect or enable any Network Capability. Network Capability may only be connected or enabled with the express written consent of the Owner.

1.15 WARRANTY

A. At a minimum, provide a one (1) year warranty for all equipment, materials, and workmanship. Individual specifications sections within Division 27 may require additional warranty requirements for specific equipment or systems.

B. The warranty period for the entire installation described in this Division of the specifications shall commence on the date of substantial completion unless a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner or their representative.

C. Warranty requirements shall extend to correction, without cost to the final user, of all work and/or equipment found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage resulting from such defects or nonconformance with contract documents exclusive of repairs required as a result of improper maintenance or operation, or of normal wear as determined by the Architect/Engineer.

1.16 INSURANCE

A. Contractor shall maintain insurance coverage as set forth in Division 1 of these specifications.

1.17 MATERIAL SUBSTITUTION

A. Where several manufacturers' names are given, the first named manufacturer constitutes the basis for job design and establishes the equipment quality required.

B. Equivalent equipment manufactured by the other named manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meets all requirements of the drawings and specifications and fits in the allocated space. When using other listed manufacturers, the Contractor shall assume responsibility for any and all modifications necessary (including, but not limited to structural supports, electrical connections and rough-in, and regulatory agency approval, etc.) and coordinate such with other contractors. The Architect/Engineer shall make the final determination of whether a product is equivalent.

C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer via addendum. The Contractor bears full responsibility for the unnamed manufacturers equipment adequately meeting the intent of design. The Architect/Engineer may reject manufacturer at time of shop drawing submittal. The Contractor assumes all costs incurred by other trades on the project as a result of changes necessary to accommodate the offered material, equipment or installation method.

D. Should this Contractor be unable to secure approval from the Architect/Engineer for other unnamed manufacturers as outlined above, this Contractor may list voluntary add or deduct prices for alternate materials on the bid form. These items will not be used in determining the low bidder. Should a voluntary alternate material be accepted, This Contractor shall assume all costs that may be incurred as a result of using the offered material, article or equipment necessitating extra expense on This Contractor or on the part of other Contractors whose work is affected.

PART 2 - PRODUCTS

2.1 CABLE JACKET RATING

A. This project requires all cable jackets to carry a plenum rating.

2.2 Refer to individual sections.

PART 3 - EXECUTION

3.1 JOBSITE SAFETY

A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or his or her employees and subconsultants at a construction site, shall relieve the Contractor and any other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and his or her personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Installation of all conduit and cabling shall comply with Sections 26 05 33 and 26 05 13. Additional conduit requirements described within this Division shall be supplemental to the requirement described in Section 26 05 33. Should conflicts exist between the two Divisions the more stringent (more expensive material and labor) condition shall prevail until bidding addendum or construction clarification or RFI can be submitted and responded to. In no case shall the Contractor carry the least stringent condition in the pricing.

B. It is the Contractor's responsibility to survey the site and include all necessary costs to perform the installation as specified.

C. The Contractor shall be responsible for identifying and reporting to the Architect/Engineer any existing conditions including but not limited to damage to walls, flooring, ceiling and furnishings prior to start of work. All damage to interior spaces caused by this Contractor shall be repaired at this Contractor's expense to pre-existing conditions, including final colors and finishes.

D. All cables and devices installed in damp or wet locations, including any underground or underslab location, shall be listed as suitable for use in such environments. Follow manufacturer's recommended installation practices for installing cables and devices in damp or wet locations. Any cable or device that fails as a result of being installed in a damp or wet location shall be replaced at the Contractor's expense.

3.3 FIELD QUALITY CONTROL

A. General:

1. Refer to specific Division 27 sections for further requirements.
2. The Contractor shall conduct all tests required and applicable to the work both during and after construction of the work.
3. The necessary instruments and materials required to conduct or make the tests shall be supplied by the Contractor who shall also supply competent personnel for making the tests who has been schooled in the proper testing techniques.
4. In the event the results obtained in the tests are not satisfactory, This Contractor shall make such adjustments, replacements and changes as are necessary and shall then repeat the test or tests which disclose faulty or defective work or equipment, and shall make such additional tests as the Architect/Engineer or code enforcing agency deems necessary.
5. All communications cable tests that fail, including those due to excessive cabling lengths, shall be remedied by the Contractor without cost to the project.

B. Protection of cable from foreign materials:

1. It is the Contractor's responsibility to provide adequate physical protection to prevent foreign material application or contact with any cable type. Foreign material is defined as any material that would negatively impact the validity of the manufacturer's performance warranty. This includes, but is not limited, to overspray of paint (accidental or otherwise), drywall compound, or any other surface chemical, liquid or compound that could come in contact with the cable, cable jacket or cable termination components.
2. Application of foreign materials of any kind on any cable, cable jacket or cable termination component will not be accepted. It shall be the Contractor's responsibility to replace any component containing overspray, in its entirety, at no additional cost to the project. Cleaning of the cables with harsh chemicals is not allowed. This requirement is regardless of the PASS/FAIL test results of the cable containing overspray. Should the manufacturer and warrantor of the structured cabling system desire to physically inspect the installed condition and certify the validity of the structured cabling system (via a signed and dated statement by an authorized representative of the structured cabling manufacturer), the Owner may, at their sole discretion, agree to accept said warranty in lieu of having the affected cables replaced. In the case of plenum cabling, in addition to the statement from the manufacturer, the Contractor shall also present to the Owner a letter from the local Authority Having Jurisdiction stating that they consider the plenum rating of the cable to be intact and acceptable.

3.4 PROJECT CLOSEOUT

A. Refer to the Division 1 Section: PROJECT CLOSEOUT for requirements. The following paragraphs supplement the requirements of Division 1.

B. Final Jobsite Observation:

1. The Architect/Engineer will not perform a final jobsite observation until the project is ready. This is not dictated by schedule, but rather by completeness of the project.
2. Refer to the end of this specification section for a "STATEMENT INDICATING READINESS FOR FINAL JOBSITE OBSERVATION."
3. The Contractor shall sign this form and return it to the Architect/Engineer so that the final observation can commence.

C. Before final payment will be authorized, this Contractor must have completed the following:

1. Submitted operation and maintenance manuals to the Architect/Engineer for review.
2. Submitted bound copies of approved shop drawings.
3. Record documents including edited drawings and specifications accurately reflecting field conditions, **inclusive** of all project revisions, change orders, and modifications.
4. Submitted a report stating the instructions given to the Owner's representative complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of This Contractor and shall be signed by the Owner's representative as having received the instructions.
5. Submitted testing reports for all systems requiring final testing as described herein.
6. Submitted start-up reports on all equipment requiring a factory installation inspection and/or start.
7. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site; submit receipt to Architect/Engineer prior to final payment being approved.
8. Provide System Assurance Warranty certificate for the telecommunications system.

3.5 OPERATION AND MAINTENANCE MANUALS

A. General:

1. Provide an electronic copy of the O&M manuals as described below for Architect/Engineer's review and approval. The electronic copy shall be corrected as required to address the Architect/Engineer's comments. Once corrected, electronic copies and paper copies shall be distributed as directed by the Architect/Engineer.
2. Approved O&M manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.

B. Electronic Submittal Procedures:

1. Distribution: Email the O&M manual as attachments to all parties designated by the Architect/Engineer.

2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. O&M file name: O&M.div27.contractor.YYYYMMDD
    b. Transmittal file name: O&Mtransmittal.div27.contractor.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.
6. Provide the Owner with an approved copy of the O&M manual on compact discs (CD), digital video discs (DVD), or flash drives with a permanently affixed label, printed with the title "Operation and Maintenance Instructions", title of the project and subject matter of disc/flash drive when multiple disc/flash drives are required.
7. All text shall be searchable.
8. Bookmarks shall be used, dividing information first by specification section, then systems, major equipment and finally individual items. All bookmark titles shall include the nomenclature used in the construction documents and shall be an active link to the first page of the section being referenced.

C. Operation and Maintenance Instructions shall include:

1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all subcontractors, and major equipment suppliers, with addresses, telephone numbers, website addresses, email addresses and point of contacts. Website URLs and email addresses shall be active links in the electronic submittal.
2. Table of Contents: Include a table of contents describing specification section, systems, major equipment, and individual items.
3. Copies of all final approved shop drawings and submittals. Include Architect's/Engineer's shop drawing review comments. Insert the individual shop drawing directly after the Operation and Maintenance information for the item(s) in the review form.
4. Copy of final approved test and balance reports.
5. Copies of all factory inspections and/or equipment startup reports.
6. Copies of warranties.
7. Schematic wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
8. Dimensional drawings of equipment.
9. Capacities and utility consumption of equipment.
10. Detailed parts lists with lists of suppliers.
11. Operating procedures for each system.
12. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
13. Repair procedures for major components.
14. List of lubricants in all equipment and recommended frequency of lubrication.

15. Instruction books, cards, and manuals furnished with the equipment.

3.6 INSTRUCTING THE OWNER'S REPRESENTATIVE

A. Adequately instruct the Owner's designated representative or representatives in the maintenance, care, and operation of the complete systems installed under this contract.

B. Provide verbal and written instructions to the Owner's representative or representatives by FACTORY PERSONNEL in the care, maintenance, and operation of the equipment and systems.

C. The Owner has the option to make a video recording of all instructions. Coordinate schedule of instructions to facilitate this recording.

D. The Architect/Engineer shall be notified of the time and place for the verbal instructions to be given to the Owner's representative so that their representative can be present if desirable.

E. Refer to the individual specification sections for minimum hours of instruction time for each system.

F. Operating Instructions:

1. The Contractor is responsible for all instructions to the Owner and/or Owner's operating staff on the Communications Systems.
2. If the Contractor does not have Engineers and/or Technicians on staff who can adequately provide the required instructions on system operation, performance, troubleshooting, care and maintenance, they shall include in the bid an adequate amount to reimburse the Owner for the Architect/Engineer to perform these services.

3.7 SYSTEM STARTING AND ADJUSTING

A. The Communications Systems included in the construction documents are to be complete and operating systems. The Architect/Engineer will make periodic job site observations during the construction period. The system start-up, testing, configuration, and satisfactory system performance is the responsibility of the Contractor. This shall include all calibration and adjustments of electrical equipment controls, equipment settings, software configuration, troubleshooting and verification of software, and final adjustments that may be required.

B. All operating conditions and control sequences shall be simulated and tested during the start-up period.

C. The Contractor, subcontractors, and equipment suppliers are expected to have skilled technicians to ensure that the system performs as designed. If the Architect/Engineer is requested to visit the job site for the purpose of trouble shooting, assisting in the satisfactory start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period through no fault of the design; the Contractor shall reimburse the Owner on a time and material basis for services rendered at the Architect/Engineer's standard hourly rates in effect at the time the services are requested. The Contractor shall be responsible for making payment to the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

3.8 RECORD DOCUMENTS

A. Refer to the Division 1 Section: PROJECT CLOSEOUT for requirements. The following paragraphs supplement the requirements of Division 1.

B. Mark specifications to indicate approved substitutions, change orders, and actual equipment and materials used.

C. This Contractor shall maintain at the job site, a separate and complete set of technology drawings which shall be clearly and permanently marked and noted in complete detail any changes made to the location and arrangement of equipment or made to the Technology Systems and wiring as a result of building construction conditions or as a result of instructions from the Architect or Engineer. All Change Orders, RFI responses, Clarifications and other supplemental instructions shall be marked on the documents. Record documents that merely reference the existence of the above items are not acceptable. Should This Contractor fail to complete Record Documents as required by this contract, This Contractor shall reimburse Architect/Engineer for all costs to develop record documents that comply with this requirement. Reimbursement shall be made at the Architect/Engineer's hourly rates in effect at the time of work.

D. Record actual routing of all conduits sized 2" or larger.

E. The above record of changes shall be made available for the Architect and Engineer's examination during any regular work time.

F. Upon completion of the job, and before final payment is made, This Contractor shall give the marked-up drawings to the Architect/Engineer.

3.9 ADJUST AND CLEAN

A. Contractor shall thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project.

B. Contractor shall clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material from equipment.

C. Contractor shall remove all rubbish, debris, etc., accumulated during the Contractor's operations from the premises.

STATEMENT INDICATING READINESS FOR FINAL JOBSITE OBSERVATION

To assist the contractor in a timely close-out of the project, it is crucial that the final jobsite observation is not conducted prior to the project being ready. The contractor is required to review the completion status of the project at the time the observation is scheduled. This review, and the subsequent submittal of this form to the Architect/Engineer, shall indicate the contractor's agreement that the area of the project being requested for final observation is ready as defined below. The following list represents the degree of completeness required prior to requesting a final observation:

1. All cabling pathways (cable tray, ladder rack, conduit sleeves, etc.) are installed and all cabling has been pulled through them.
2. All mechanical firestop products are installed and all other penetrations have been sealed.
3. All telecommunications jacks are installed in the faceplates.
4. All telecommunications cabling is pulled and at least 75% of all jacks have been terminated at the jack and at the telecom room.
5. Telecommunications testing is in progress and at least 25% of testing has been completed.
6. Telecommunications labeling has been provided on at least 25% of each type of component requiring a label.
7. All telecommunications related grounding is complete.
8. All Audio/Visual components, cabling and control systems are installed, programmed and operational.
9. All overhead or integrated paging systems, including speakers, back boxes, cabling, and power supplies, and all headend equipment is installed, programmed and operational.
10. All CCTV cameras, mounts, cabling and all headend equipment are installed, programmed and operational.
11. All access control system equipment, including card readers, conduits, cabling, electronic locks, controllers and all headend equipment, is installed, programmed and operational.

Prime Contractor: _____ By: _____

Requested Observation Date _____ Today's Date: _____

Contractor shall sign this readiness statement and transmit to Architect/Engineer at least 10 days prior to the requested date of observation.

It is understood that if the Architect/Engineer finds that the project is not complete as defined above and that the final jobsite observation cannot be completed on the requested date, the Architect/Engineer will return to the site at a later date. All additional visits to the site for the purposes of completing the final observation will be billed T&M to the Contractor at our standard hourly rates, including travel expenses or the contractor's retainage may be deducted for the same amount.

TELECOMMUNICATIONS - PROOF OF CERTIFICATION

There are specific Contractor qualification requirements for this project as defined in Section 27 05 00, which may include Manufacturer Certification and RCDD or CNIDP credentials. This Proof of Certification document, and the supporting documentation require herein, is required to be submitted at the time of bid to show compliance with the requirements of 27 05 00.

Statement of Compliance:
The named Contractor's base bid is a structured cabling solution from the connectivity manufacturer _____. Named Contractor is trained and certified, under the named manufacturer's formal certification program to provide and install all materials and work required by this project. Further, said Contractor is authorized, by the named manufacturer, to offer all product, labor and system assurance warranties required for this project by these contract documents.

The certification of this named manufacturer is valid, current and in effect as of the bid day of this project, the _____ day of _____, 20____.

The named Contractor is not employing any other sub-contractor on the telecommunications portion of this project that does not also meet this certification requirement.

Contractor Company Name:
_____

Authorized Representative: (print)
_____

Date: _____
Manufacturer Certification Number (if any): _____

If this project requires RCDD certification, complete the following:

RCDD or CNIDP Name: _____
RCDD #: _____ Expiration: _____

Submit the following with the bid:
This form.
Proof of Manufacturer Certification indicated above.
Proof of RCDD or CNIDP status.

END OF SECTION 27 05 00

SECTION 27 05 05 - TECHNOLOGY DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Technology demolition.

1.2 RELATED WORK

A. Section 27 05 00 - Basic Communications Systems Requirements.

1.3 REFERENCES

A. NFPA 70 - National Electrical Code.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for terminating, patching and cross connecting of existing telecommunications and security systems shall be as specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. THE DRAWINGS ARE INTENDED TO INDICATE THE SCOPE OF WORK REQUIRED AND DO NOT INDICATE EVERY OUTLET, BOX, CONDUIT, OR CABLE THAT MUST BE REMOVED.

B. THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO SUBMITTING A BID AND VERIFY EXISTING CONDITIONS AND SCOPE OF WORK.

C. Whenever possible, the Contractor shall coil existing cable above ceiling for re-termination if cable length will allow. Re-terminated cables shall be tested for wire map and continuity.

D. Where walls, ceilings, structures, etc., are indicated as being renovated on general drawings, the Contractor shall be responsible for the removal of all technology equipment including but not limited to: copper, fiber and coaxial cable, faceplates and jacks, raceways, racking and equipment mounted to the racking, etc., from the renovated area.

E. Where ceilings, walls, structures, etc., are temporarily removed and replaced by others, this Contractor shall be responsible for the removal, storage, and replacement of equipment, devices, fixtures, raceways, wiring, systems, etc.

F. Verify that abandoned wiring and equipment serve only abandoned equipment or facilities. Extend conduit and wire to facilities and equipment that will remain in operation following demolition. Extension of conduit and wire to equipment shall be compatible with the surrounding area.

G. Coordinate scope of work with all other Contractors and the Owner at the project site. Schedule removal of equipment and technology service to avoid conflicts.

3.2 PREPARATION

A. Not all services within the building will be inactive or abandoned. Verify abandonment status with the building owner, General Contractor and Architect/Engineer prior to demolition.

B. Prior to commencing with demolition, a proposed implementation narrative with schedule shall be submitted to the Architect/Engineer for approval.

C. The contractor shall provide proof that only qualified personnel with extensive telecommunications experience will perform the demolition. No laborers will be allowed in the cable removal process.

D. The contractor shall coordinate with owner to verify all cabling, patch cords and cross connects have been removed from active equipment that is to remain during the duration of the renovation.

E. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on active equipment, use technicians experienced in such operations. Assume all equipment and systems must remain operational unless specifically noted otherwise on drawings.

F. Existing security System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from the Owner at least twenty-four (24) hours before partially or completely disabling system. Minimize outage duration. **Make temporary connections to maintain service in areas adjacent to work area.**

3.3 DEMOLITION AND EXTENSION OF EXISTING TECHNOLOGY WORK

A. Demolish and extend existing technology work under provisions of Division 1 of Architectural Specifications and this Section.

B. Some cabling within the ceiling space may serve other building tenants; care shall be exercised to prevent service interrupts.

C. Remove, relocate, and extend existing installations to accommodate new construction.

D. Remove abandoned low voltage cabling and raceway to source of cabling according to the NEC. Refer to the NEC for definition of Abandoned Communications Cabling.

E. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces. Remove all associated clamps, hangers, supports, etc. associated with raceway removal.

F. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is removed. **Provide blank cover for abandoned outlets that are not removed.**

G. Disconnect and remove abandoned patch panels, blocks and other distribution equipment.

H. Repair adjacent construction and finishes damaged during demolition and extension work.

I. Maintain access to existing technology installations that remain active. Modify installation or provide access panels as appropriate.

J. Extend existing installations using materials and methods compatible with existing technology installations, or as specified.

K. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

L. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that remain or are to be reused.

B. Patch panels, blocks and other connectivity equipment: Clean exposed surfaces and check tightness of connections. Re-terminate any loose connections; the contractor shall notify the Architect/Engineer of any permanently damaged or unusable equipment.

C. TECHNOLOGY ITEMS (E.G., PATCH PANELS, EQUIPMENT RACKS, JACKS, FACEPLATES, BLOCKS, CABLING, ETC.) REMOVED AND NOT RELOCATED REMAIN THE PROPERTY OF THE OWNER. CONTRACTOR SHALL PLACE ITEMS RETAINED BY THE OWNER IN A LOCATION COORDINATED WITH THE OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DISPOSAL OF MATERIAL THE OWNER DOES NOT WANT.

3.5 INSTALLATION

A. Install relocated materials and equipment under the provisions of applicable Division 27 specifications.

END OF SECTION 27 05 05

SECTION 27 05 26 - COMMUNICATIONS BONDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Bonding Conductors

B. Bonding Connectors

C. Grounding Busbar (PBB and SBB)

D. Rack-mount Telecommunications Grounding Busbar

1.2 RELATED WORK

A. Section 26 05 33 - Conduit and Boxes

B. Section 26 05 13 - Wire and Cable

C. Section 26 05 26 - Grounding and Bonding

D. Section 26 41 00 - Lightning Protection Systems

E. Section 27 05 00 - Basic Communications Systems Requirements

F. Section 27 11 00 - Communication Equipment Rooms

G. Section 27 05 28 - Interior Communication Pathways

H. Section 27 05 53 - Identification and Administration

1.3 QUALITY ASSURANCE

A. Refer to Section 27 05 00 for relevant standards.

B. Communications bonding system component, device, equipment, and material manufacturer(s) shall have a minimum of five (5) years documented experience in the manufacture of communications bonding products.

C. The entire installation shall comply with all applicable electrical codes, safety codes, and standards. All applicable components, devices, equipment, and material shall be listed by Underwriters' Laboratories, Inc.

1.4 REFERENCES

A. ANSI/IEEE 1100 - Recommended Practice for Power and Grounding Sensitive Electronic Equipment in Industrial and Commercial Power Systems

B. ANSI/TIA 568-C - Commercial Building Telecommunications Cabling Standard

C. ANSI/TIA 569-A - Commercial Building Standard for Telecommunications Pathways and Spaces

D. ANSI/TIA 606 - Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

E. ANSI-J-STD-607-A - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

F. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System Part 1: Normal Measurements

G. IEEE 837 - IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding

H. NFPA 70 - National Electrical Code

I. NFPA 780 - Standard for the Installation of Lightning Protection Systems

J. UL 96 - Lightning Protection Components

K. UL 96A - Installation Requirements for Lightning Protection Systems

L. UL 467 - Grounding and Bonding Equipment

1.5 SUBMITTALS

A. Submit product data and shop drawings under provisions of Section 27 05 00 and Division 1.

B. Provide manufacturer's technical product specification sheet for each individual component type. Submitted data shall show the following:

1. Compliance with each requirement of these documents. The submittal shall acknowledge each requirement of this section, item-by-item, including construction, materials, ratings, and all other parameters identified in Part 2 - Products.
2. Manufacturer's installation instructions indicating application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

C. Provide CAD-generated, project-specific system shop drawings as follows:

1. Provide a system block diagram indicating system configuration, system components, interconnection between components, and conductor routing. The diagram shall clearly indicate all wiring and connections required in the system. When multiple devices or pieces of equipment are required in the exact same configuration (e.g., multiple identical equipment racks or sections of ladder tray), the diagram may show one device and refer to the others as "typical" of the device shown. The diagram shall list room numbers where system equipment will be located.
2. Installation details for all system components.

D. Provide system checkout test procedure to be performed at acceptance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the site under the provisions of Section 27 05 00.

B. Store and protect products under the provisions of Section 27 05 00.

C. Contractor shall exercise care to prevent corrosion of any products prior to installation. Corroded products shall not be acceptable for use on this project.

1.7 SYSTEM DESCRIPTION

A. This section describes the requirements for the furnishing, installation, adjusting, and testing of a complete turnkey communications bonding system, including connection to the electrical ground grid.

B. Performance Statement: This specification section and the accompanying drawings are performance based, describing the minimum material quality, required features, operational requirements, and performance of the system. These documents do not convey every wire that must be installed, every equipment connection that must be made, or every feature and function that must be configured. Based on the equipment constraints described and the performance required of the system as presented in these documents, the Contractor is solely responsible for determining all components, devices, equipment, wiring, connections, and terminations required for a complete and operational system that provides the required performance.

C. This document describes the major components of the system. All additional hardware, subassemblies, supporting equipment, and other miscellaneous equipment required for complete, proper system installation and operation shall be provided by the Contractor.

D. Basic System Requirements:

1. A complete communications bonding infrastructure is required for this project. Refer to the drawings and the requirements of ANSI-J-STD-607-**A** and NFPA 70 for complete information.

2. The bonding system shall include, but not be limited to, the following major components:

    a. Telecommunications Bonding Conductor (TBC)
    b. Primary Bonding Busbar (PBB)
    c. Telecommunications Bonding Backbone (TBB)
    d. Secondary Bonding Busbar(s) (SBB)
    e. Rack mount Telecommunications Grounding Busbar(s)
    f. Bonding Conductor(s) (BC)
    g. Bonding Connectors
    h. Bonding system labeling and administration as defined in Section 27 05 53.

1.8 PROJECT RECORD DOCUMENTS

A. Submit documents under the provisions of Section 27 05 00.

B. Provide final system block diagram showing any deviations from approved shop drawing submittal.

C. Provide floor plans that document the following:

1. Actual locations of system components, devices, and equipment.
2. Actual conductor routing.
3. Actual system component, device, equipment, and conductor labels.

D. Provide statement that system checkout test, as outlined in the approved shop drawing submittal, is complete and test results were satisfactory.

E. Complete all operation and maintenance manuals as described below.

PART 2 - PRODUCTS

2.1 BONDING CONDUCTORS

A. Bare Copper:

1. Annealed uncoated stranded conductor.
2. Minimum size 6 AWG.

B. Insulated Copper:

1. Annealed uncoated stranded conductor.
2. Insulation:

    a. PVC insulation with nylon outer jacket.
    b. Rated at 600 volts.
    c. Green.

3. Minimum size 6 AWG.

C. All bonding conductors shall be listed and recognized by a nationally recognized testing laboratory as being suitable for the intended purpose and for installation in the space in which they are installed.

D. Bonding Conductor Sizing:

1. All communications bonding system conductors shall be sized by length as follows:

Length Linear ft (m)	Size (AWG)
Less than 13 (4)	6
14 - 20 (4 - 6)	4
21 - 26 (6 - 8)	3
27 - 33 (8 - 10)	2
34 - 41 (10 - 13)	1
42 - 52 (13 - 16)	1/0
53 - 66 (16 - 20)	2/0
67 - 84 (20 - 26)	3/0
85 - 105 (26 - 32)	4/0
106 - 125 (32 - 38)	250 kcmil
126 - 150 (38 - 46)	300 kcmil
151 - 175 (46 - 53)	350 kcmil
176 - 250 (53 - 76)	500 kcmil
251 - 300 (76 - 91)	600 kcmil
Greater than 301 (91)	750 kcmil

2. The TBC shall be the same size as the TBB or larger.

2.2 BONDING CONNECTORS

A. Acceptable Types:

1. Two-hole compression lug
2. Exothermic weld
3. Irreversible compression

B. Connectors shall be provided in kit form and selected per manufacturer's written instructions.

C. Connectors shall comply with IEEE 837 and UL 467 and be listed for use for specific types, sizes, and combinations of conductors and connected items.

2.3 GROUNDING BUSBAR (PBB AND SBB)

A. Features:

1. Wall-mount configuration.
2. Listed and recognized by a nationally recognized testing laboratory as being suitable for intended purpose.

3. Hole patterns compliant with BICSI recommendations and ANSI-J-STD-607-D standards.
4. Predrilled holes.
5. Integral insulators.
6. Stainless steel offset mounting brackets.

B. Specifications:

1. Material: Electrolytic tough pitch copper bar with tin plating.
2. Refer to drawings for grounding busbar size(s).

    a. Minimum Dimensions: Refer to drawings.
    b. Increase dimensions and/or quantity furnished and installed as required to accommodate all terminations required by the project, plus 20% spare capacity.
    c. Hole patterns on busbars accommodate two-hole lugs per the recommendation of ANSI/BICSI N3-20 and ANSI/TIA-607 standards.

2.4 RACK-MOUNT TELECOMMUNICATIONS GROUNDING BUSBAR

A. Features:

1. Listed and recognized by a nationally recognized testing laboratory as being suitable for intended purpose.
2. Predrilled holes.
3. Mounts in a standard 19" equipment rack.

B. Specifications:

1. Material: Electrolytic tough pitch copper bar with tin plating.
2. Minimum Dimensions: 3/16" thick x 3/4" high x 19" long.

    a. Increase dimensions and/or quantity furnished and installed as required to accommodate all terminations required by the project, plus 20% spare capacity.

3. Hole pattern shall include:

    a. A minimum of eight (8) 6-32 tapped lug mounting holes on 1" centers.
    b. A minimum of two (2) pairs of 5/16" diameter holes spaced 3/4" apart.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Bonding Requirements:

1. The communications bonding system shall be a complete system. Contractor shall furnish and install all necessary miscellaneous components, devices, equipment, material, and hardware, including, but not limited to, lock washers, paint-piercing washers, hex nuts, compression lugs, insulators, mounting screws, lugs, etc., to provide a complete system.
2. Comply with the manufacturer's instructions and recommendations for installation of all products.

B. Main Cross Connect and Service Entrance Room Bonding Requirements:

1. Locate the PBB in the service entrance room unless otherwise noted on the drawings.
2. The location of the PBB shall be the shortest practical distance from the telecommunications primary lightning protection devices.
3. Bond the telecommunications primary protectors to the PBB. Maintain a minimum 1 foot separation of the bonding conductor from all DC power cables, switchboard cable, and high frequency cable.
4. In service entrance rooms where the entrance pathway contains an isolation gap, the pathway on the facility side of the gap shall be bonded to the PBB.

C. Where the service entrance cable contains a shield, the shield(s) shall be bonded to the PBB using manufacturer-approved hardware.

D. Primary Bonding Busbar (PBB) Requirements:

1. Install PBB such that it is insulated from its support with a minimum 2" standoff.
2. Bond the PBB to the electrical service ground via the TBC.

    a. A minimum of 1 foot separation shall be maintained between the TBC and any DC power cables, switchboard cable, or high frequency cables.

3. Where backbone or horizontal cabling contains a shield, the shield(s) shall be bonded to the PBB.
4. PBB shall be bonded to all electrical panels located in the same room or space as the PBB. PBB shall be bonded to all electrical panels providing electrical power to communications equipment located in the same room or space as the PBB.
5. PBB shall be bonded to accessible metallic building structure located within the same room or space as the PBB.
6. All metallic continuous cable pathways, including, but not limited to, cable trays, basket trays, ladder racks, raceways, conduits, conduit sleeves, and fire-rated cable pathway devices, located within the same room or space as the PBB, shall be bonded to the PBB.
7. All metallic communications equipment, including, but not limited to, cable pair protectors, surge suppressors, cross-connect frames, patch panels, equipment cabinets, etc., located within the same room or space as the PBB, shall be bonded to the PBB.

E. Secondary Bonding Busbar (SBB) Requirements:

1. Provide a SBB in each telecommunications equipment room.

2. Install SBB such that it is insulated from its support with a minimum 2" standoff.
3. Bond each SBB to the PBB via the TBB.

    a. A minimum of 1 foot separation shall be maintained between the TBB and any DC power cables, switchboard cable, or high frequency cables.
    b. The TBB may be routed from PBB to SBB or as a radial feed to each SBB as the layout requires.

4. When two or more TBBs are used within a multi-story building, the TBBs shall be bonded together with a BBC at the top floor and at a minimum of every third floor in between the lowest floor level.
5. If more than one (1) SBB is provided within the same room or space, they shall all be bonded together via a BC the same size as the TBB.
6. Where horizontal cabling contains a shield, the shield(s) shall be bonded to the SBB.
7. SBBs shall be bonded to accessible metallic building structure located within the same room or space as the SBBs.
8. SBBs shall be bonded to all electrical panels located in the same room or space as the SBB. SBBs shall be bonded to all electrical panels providing electrical power to communications equipment located in the same room or space as the SBB.
9. All metallic continuous cable pathways, including, but not limited to, cable trays, basket trays, ladder racks, raceways, conduits, conduit sleeves, and fire-rated cable pathway devices, located within the same room or space as the SBB, shall be bonded to the SBB.
10. All metallic communications equipment, including, but not limited to, cable pair protectors, surge suppressors, cross-connect frames, patch panels, equipment cabinets, etc., located within the same room or space as the SBB, shall be bonded to the SBB.

F. Rack Bonding Busbar Requirements (RBB):

1. Provide a rack-mount telecommunications ground bar in each equipment rack.
2. Install RBB such that it is electrically bonded to the rack. Where necessary, remove paint and/or use paint-piercing washers to provide proper electrical bond between RBB and equipment rack.
3. Bond each RBB to the PBB/SBB via a telecommunications equipment bonding conductor (TEBC).
4. If more than one (1) RBB is provided within the same room or space, they shall all be bonded together via a TEBC.
5. Where horizontal cabling containing a shield is terminated on rack-mounted termination hardware, the shield(s) shall be bonded to the RBB.
6. All contractor-furnished and/or contractor-installed metallic communications equipment, including, but not limited to patch panels, fiber optic distribution enclosures, splice enclosures, active electronics, uninterruptible power supplies, etc., mounted within the same equipment rack as the RBB, shall be bonded to the RBB. Where necessary, remove paint and/or use paint-piercing washers to provide proper electrical bond between equipment rack and installed metallic communications equipment. Active electronics and uninterruptible power supplies shall be bonded to the RBB via a dedicated unit bonding conductor (UBC) for each device.

G. Metallic Interior Communication Pathway Bonding Requirements:

1. All metallic interior continuous communication cable pathways, including, but not limited to, conduit, conduit sleeves, fire-rated cable pathway devices, cable tray, basket tray, and ladder rack, shall be bonded to the communications bonding system.

H. Bonding Conductor Requirements:

1. Bonding conductors shall be green or marked with a distinctive green color.
2. Bonding conductors shall be routed parallel and perpendicular to building structure along shortest and straightest paths possible. Number of bends and changes in direction should be minimized. Install and secure conductors in a manner that protects the conductors from impact and from physical or mechanical strain or damage.
3. Bonding conductors shall not be installed in metallic conduit.
4. All conductors, including, but not limited, to the TBC, TBB, BBC, and TEBC(s), shall be installed splice-free. If the Contractor believes that site conditions do not allow a splice-free installation, the Contractor may request permission from the Architect/Engineer to splice a specific communications bonding system conductor.

    a. Where documented permission to splice a conductor is granted:

        1) The number of splices shall be limited to as few as possible.
        2) Splices shall be made using exothermic welding or irreversible compression-type connections only. Splice hardware shall be listed for grounding and bonding. Solder is not an acceptable means of splicing conductors.
        3) Splices shall be made in telecommunications spaces in accessible locations to facilitate future inspection and maintenance.
        4) Splices shall be adequately supported and protected from impact and from physical or mechanical strain or damage.

5. All bonding conductors shall be labeled in accordance with the requirements of Section 27 05 53. In addition to the requirements of Section 27 05 53:

    a. Labels shall be nonmetallic.
    b. Labels shall be printer-generated.
    c. Labels shall be located on conductors as close as is practical to their point of termination in a readable position.
    d. Additionally, conductors shall be labeled as follows:

        1) "IF THIS CONNECTOR OR CABLE IS LOOSE OR MUST BE REMOVED, PLEASE CALL THE BUILDING TELECOMMUNICATIONS MANAGER."

6. Interior water piping is not acceptable for use as a communications bonding system bonding conductor.
7. Metallic cable shields are not acceptable for use as communications bonding system bonding conductors.

I. Bonding Connection Requirements:

1. Make all connections in accessible locations to facilitate future inspection and maintenance.
2. Communications bonding system connections shall be made using exothermic welding, two-hole compression lugs, or other irreversible compression-type connections. The use of 1-hole lugs is prohibited, except for connections to a rack-mount telecommunications ground bar. Connection hardware shall be listed for grounding and bonding. Sheet metal screws shall not be used to make communications bonding system connections.
3. Thoroughly clean conductors before installing lugs and connectors.
4. Install and tighten all connectors in accordance with manufacturer's instructions, using the appropriate purpose-designed tool(s) recommended by the manufacturer for that purpose. Exercise care not to tighten connectors beyond manufacturer's recommendations.
5. Where necessary, remove paint and/or use paint-piercing washers to provide proper electrical bond at all connections.
6. All bonding connections shall be coated in anti-oxidant joint compound that is purpose-designed and purpose-manufactured for that use. Anti-oxidant joint compound shall be applied in accordance with manufacturer's recommendations and instructions.
7. All installed connectors on conductors installed in damp locations shall be sealed with dielectric grease and then covered with heat shrink tubing to protect against moisture ingress. Applied heat shrink tubing shall overlap conductor's outer jacket a minimum of four (4) inches past connector and be installed in accordance with manufacturer's recommendations and instructions.

3.2 FIELD QUALITY CONTROL

A. Field inspection and testing shall be performed under provisions of Section 27 05 00.

B. Where these specifications require a product or assembly without the use of a brand or trade name, provide a product from a reputable manufacturer that meets the requirements of the specifications.

C. Periodic observations will be performed during construction to verify compliance with the requirements of the specifications. These services do not relieve the Contractor of responsibility for compliance with the contract documents.

3.3 ADJUSTING

A. Adjust work under provisions of Section 27 05 00.

B. Contractor shall make any and all adjustments to the communications bonding system necessary to ensure that the installed system meets all requirements listed herein. Modifications necessary to comply with listed requirements or to provide specified performance shall be completed by the Contractor at no additional cost to the Owner.

3.4 TESTING

A. Measure and document resistance to ground at PBB, each SBB, each RBB, and each electrical distribution panel bonded to the PBB or a SBB.

1. Measurements shall be made not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage, and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the fall-of-potential method according to IEEE 81.
2. The preferred measured resistance to ground for the grounding electrode system is 10 ohms or less. Refer to Division 26 for exact project requirements.
3. Under no circumstances shall any point in the communications bonding system have a lower resistance to ground than that of nearby electrical distribution system components that it is bonded to.

B. Two-point Ground/Continuity Test:

1. Two-point ground continuity test shall be performed per TIA-607D standards.
2. Contractor shall use an earth ground resistance tester to confirm a resistance of less than 100 milliohms between the building's electrical grounding electrode system and any other point in the telecommunications bonding system.
3. At a minimum, perform tests in the following areas:

a. PBB to the electrical ground in distributors
b. Each SBB to the electrical ground in distributors
c. PBB/SBB to the structural metal (if present)
d. PBB to SBB(s)
e. Structural metal (if present) to the electrical ground

4. Complete testing prior to installation of Owner-provided equipment.

C. Measure and document voltage between screen of installed and terminated ScTP, FTP, and/or SSTP horizontal cables and electrical ground of electrical outlet(s) serving the information outlet location area.

1. The voltage between the screen and the ground wire shall not exceed 1.0 V rms, and 1.0 V dc for any installed and terminated ScTP, FTP, and/or SSTP horizontal cables.

D. Include measurement documentation in test data submitted at completion of project under provisions of Section 27 17 10.

3.5 SYSTEM TRAINING

A. All labor and materials required for on-site system training shall be provided. Training shall be conducted at the project site using the project equipment.

1. Provide two week's advanced notice of training to the Owner and Architect/Engineer.
2. The Architect/Engineer shall be presented with the option to attend the training.

3. Provide a training outline agenda describing the subject matter and the recommended audience for each topic.

B. At a minimum, the following training shall be conducted:

1. A course detailing the system functions and operations that a technical user will encounter. Provide training on all aspects of using the system, including making new bonding connections to the PBB, SBB, or RBB. Provide training on all recommended inspection, maintenance, and repair procedures for the system.

C. Minimum on-site training times shall be:

1. Technical user: Two (2) hours.

END OF SECTION 27 05 26

SECTION 27 05 28 - INTERIOR COMMUNICATION PATHWAYS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, tests and services to install complete support systems, conduits, sleeves, innerduct, etc. for an interior cabling plant as shown on the drawings.

1.2 RELATED WORK

A. Section 26 05 33 - Conduit and Boxes

B. Section 27 05 00 - Basic Communications Systems Requirements

C. Section 27 05 26 - Communications Bonding

1.3 QUALITY ASSURANCE

A. Refer to Section 27 05 00 for requirements.

1.4 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code

1.5 SUBMITTALS

A. Under the provisions of Section 27 05 00 and Division 1, prior to the start of work the Contractor shall submit:

1. Manufacturer's data covering all products proposed, including construction, materials, ratings and all other parameters identified in Part 2 - Products, below.
2. Manufacturer's installation instructions.

B. Coordination Drawings:

1. Include cable tray and conduit sleeve layout in composite electronic coordination files. Refer to Section 27 05 00 for coordination drawing requirements.

1.6 DRAWINGS

A. The drawings, which constitute a part of these specifications, indicate the general route of the wire mesh support systems, conduit, sleeves, etc. Data presented on these drawings is as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification of all dimensions, routing, etc., is required.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Refer to Section 26 05 33 for conduit requirements for this project.

2.2 CABLE HANGERS AND SUPPORTS

A. Provide a non-continuous cable support system suitable for use with open cable.

B. Cable Hooks:

1. Construction: Flat bottom design with a minimum cable bearing surface of 1-5/8". Hooks shall have 90-degree radius edges.
2. All cable hook mounting hardware shall be recessed to prevent damage to cable during installation. Installed cabling shall be secured using a cable latch retainer that shall be removable and reusable.
3. Finish: Pre-galvanized steel, ASTM A653 suitable for general duty use.

C. Cable Hangers:

1. Adjustable, non-continuous cable support slings for use with low voltage cabling.
2. Steel and woven laminate construction, rated for indoor non-corrosive use. Laminate material shall be suitable for use in plenum environments.
3. Sling length shall be adjustable to a capacity of 425 4-pair UTP cables.
4. Cabling hanger load limit shall be 100 lbs per foot.
5. Manufacturer:

    a. Erico Caddy
    b. CableCat CAT425
    c. Arlington Fittings Tl Series
    d. Or approved equal.

2.3 INNERDUCT - CORRUGATED

A. Fabricated from self-extinguishing high-impact polyvinyl chloride (PVC), orange in color.

B. Fittings and accessories fabricated from same material as conduit and usable with rigid nonmetallic conduit.

C. Solvent-cement type joints as recommended by manufacturer.

D. Inside diameter not less than that of rigid steel conduit.

E. Dielectric strength a minimum of 400 volts per mil.

F. Corrugated wall construction.

G. Pull rope pre-installed by manufacturer.

H. Innerduct installed within buildings (not including riser paths) or utility tunnels shall meet all the above General requirements plus:

1. Be fabricated of flame-retardant materials (plenum rated) suitable for installation in such environments.
2. Meet or exceed all requirements for flame resistant duct as required by Bellcore TR-NWT-000356 (Section 4.33).

I. Innerduct installed within building riser shafts shall meet all the above general requirements plus:

1. Be fabricated of flame-retardant materials suitable for installation in such environment.

J. Meet or exceed all requirements for flame propagation as specified by test method UL-1666 and referenced by the National Electrical Code (NEC) Section 770-53 for listed optical fiber raceways being installed in vertical runs in a shaft between floors.

PART 3 - EXECUTION

3.1 INNER DUCT INSTALLATION REQUIREMENTS

A. Inner duct shall be riser or plenum rated as required by the installation environment. At minimum, inner duct should extend to the ladder rack above the termination enclosure at system endpoints. Where not installed in a continuous length, inner duct segments should be spliced using couplings designed for that purpose.

B. All exposed inner duct is to be labeled at 35-foot intervals with tags indicating ownership, the cable type (e.g., "Fiber Optic Cable") and the cables it contains (e.g., MA-CS or FS-CS).

C. Where exposed, fiber optic cable shall be installed in protective inner duct.

D. Contractor shall determine optimum size and quantity to satisfy the requirements of the installation and to ensure that the mechanical limitations, including minimum bend radius of the cable, are considered.

E. The inner duct should extend into the termination enclosure at system endpoints.

F. Where not installed in a continuous length, inner duct segments should be spliced using couplings designed for that purpose.

3.2 CABLE HOOK SUPPORT SYSTEM

A. In areas where cabling is not supported by cable tray, ladder rack, enclosed wireway or installed in conduit, such cabling shall be supported by an approved cable hook support system.

B. Refer to manufacturer's requirements for allowable fill capacity for selected cable hook. In no case shall a 40% fill capacity be exceeded.

C. Cable hooks shall be securely mounted per manufacturer's instructions. In no case shall the side-to-side travel of any cable hook exceed 6".

D. Cable hooks shall be selected based on the contractor's cable routing. Hooks shall be capable of supporting a minimum of 30 pounds with a safety factor of 3.

E. J-hook support spans shall be based on the smaller of the manufacturer's load ratings and code requirements. In no case shall horizontal spans exceed 5 feet and vertical spans exceed 4 feet.

F. The resting and supporting of cabling on structural members shall not meet the requirements for cabling support specified herein.

G. The use of tie-wraps or hook and loop type fasteners is specifically prohibited as a substitute for cable hooks specified herein.

3.3 CONDUIT AND CABLE ROUTING

A. Refer to Section 26 05 33 for additional requirements.

B. All conduits shall be reamed and shall be installed with a nylon bushing.

C. Maintain appropriate conduit bend radius at all times. For conduits with an internal diameter of less than 2", maintain a bend radius of at least 6 times the internal diameter. For conduits with an internal diameter 2" or greater, maintain a bend radius of at least 10 times the internal diameter.

D. No conduit or sleeve containing more than two (2) cables shall exceed 40% fill ratio, regardless of length.

E. Any conduit exceeding 90' in length or containing more than two (2) 90-degree bends shall contain a pull box sized per ANSI/TIA/EIA 569 requirements.

1. A separate pull box is required for each 90' (or greater) length section.
2. A separate pull box is required after any two (2) consecutive 90-degree bends.
3. Pull box shall be located in an area that maintains accessibility of box, including the ability to remove box lid without removal or relocation of any other materials.

F. Any conduit with bends totaling 90 degrees or more shall have the fill capacity derated by 15% for each 90 degrees of cumulative bend.

G. Cables installed in any conduits that do not meet the above requirements shall be replaced at the Contractor's expense, after the conduit condition has been remedied.

3.4 ATTACHMENT TO METAL DECKING

A. Where supports for cable trays and cable hook systems attach to metal roof decking, excluding concrete on metal decking, do not exceed 25 lbs. per hangar and a minimum spacing of 2'-0" on center. This 25-lb. load and 2'-0" spacing include adjacent electrical and mechanical items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.

END OF SECTION 27 05 28

SECTION 27 05 53 - IDENTIFICATION AND ADMINISTRATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section describes the identification and administration requirements relating to the structured cabling system and its termination components and related subsystems.

B. Identification and labeling.

1.2 RELATED WORK

A. Section 27 05 00 - Basic Communications Systems Requirements

1.3 QUALITY ASSURANCE

A. Refer to Section 27 05 00 for relevant standards.

B. Perform all work in accordance with Caseyville, Illinois published standards where applicable.

1.4 SUBMITTALS

A. Under the provisions of Section 27 05 00 and Division 1, prior to the start of work the Contractor shall submit:

1. Documentation of labeling scheme.
2. Complete documentation of nomenclature for all Administration components.

PART 2 - PRODUCTS

2.1 LABELING

A. Adhesive labels shall meet the requirements of UL 969 (Ref D-16) for legibility, defacement and adhesion. Exposure requirements of UL 969 for indoor and outdoor (as applicable) use shall be met.

B. Insert labels shall meet the requirements of UL 969 for legibility, defacement and general exposure.

C. Labeling shall be consistent for all common elements in the project. This consistency shall include label size, color, typeface an attachment method.

D. Labels incorporating bar codes shall be either Code 39 conforming to USS-39 or Code 128 conforming to USS-128.

1. All Code 39 bar codes shall have a ratio between 2.5:1 and 3.0:1. Provide a minimum "quite zone" of 0.25" on each side of the bar code.

2. A descriptive label for reading by personnel shall be provided with any bar code. Bar codes by themselves are not acceptable.

E. Color Code: Observe the following requirements for color coding:

1. Labels on each end of a cable shall be the same color for each termination.
2. Labels for cross-connects shall be two different colors at each termination fields, representative of the color of that field.
3. Orange (Pantone 15C) shall be used for the demarcation point.
4. Green (Pantone 353C) shall be used for the termination point of network connection on the facility side of the demarc.
5. Purple (Pantone 264C) shall be used to identify the termination of cables from common equipment (PBX, computers, LANS, etc.)
6. White shall be used to identify the first-level backbone termination in the main cross-connect.
7. Gray (Pantone 422C) shall be used to identify the second-level backbone termination in the main cross-connect.
8. Blue (Pantone 291C) shall be used to identify the termination of station cabling at the telecommunications closet and/or equipment room end of the cable.
9. Brown (Pantone 465C) shall be used to identify the termination of the interbuilding backbone cable terminations.
10. Yellow (Pantone 101C) shall be used to identify the termination of auxiliary circuits, alarms, maintenance, security, etc.
11. Red (Pantone 184C) shall be used to identify the termination of key telephone systems.
12. In facilities that do not contain a main cross-connect, the color white may be used to identify second-level backbone terminations.

F. Tag all CAT 3, CAT 5E, CAT 6, and optical fiber cables at both the Communications Equipment Room and the information outlets using the following alphanumeric labeling system:

1. (Room Number) - (Outlet Number) - (Jack Number) - (Use).
2. "Outlet Number" shall start with 1 in each room, with additional outlets in each room numbered sequentially.
3. "Jack Number" shall start with 1 for the upper left jack in each outlet, increasing sequentially from left to right and top to bottom across the outlet face.
4. "Use" shall be designated by the following:

    a. "V" for voice (RJ-45)
    b. "D" for data (RJ-45)
    c. "C" for video (coax)
    d. "M" for multimedia retrieval (coax)
    e. "S" for speaker (RCA)

5. Example #1: "106-1-1-V" indicates the top left voice jack in outlet #1 in Room 106.
6. Example #2: "109-3-4-D" indicates the bottom right data jack (assuming a 4-port faceplate) in outlet #3 in Room 109.

G. Tag all CAT 3, CAT 5E, CAT 6, and optical fiber cables at both the Communications Equipment Room and the information outlets using the following alphanumeric labeling system:

1. (Telecom Room Number) - (Patch Panel Letter) - (Patch Panel Port Number).
2. "Telecom Room Number" shall be as indicated on the drawings.
3. "Patch Panel Letter" shall start with 'A' for the top modular patch panel, increasing sequentially from top to bottom across the equipment rack.
4. "Patch Panel Port Number" shall start with '1' for the upper left port in each modular patch panel, increasing sequentially from left to right and top to bottom across the modular patch panel face.
5. Example #1: MC/1-A3 indicates the third modular patch panel port in modular patch panel 'A' in Main Equipment Room (MC/1).
6. Example #2: HC/2-C39 indicates the thirty-ninth modular patch panel port in modular patch panel C in Horizontal Cross-Connect room (HC/2).

2.2 DOCUMENTATION/AS-BUILTS/RECORDS

A. General:

1. Upon completion of the installation, the Contractor shall submit as-builts per the requirements of Section 27 05 00 and Division 1. Documentation shall include the items detailed in the subsections below.
2. All documentation, including hard copy and electronic forms shall become the property of the Owner.

B. Record Drawings:

1. The drawings are to include cable routes and outlet locations. Outlet locations shall be identified by their sequential number as defined elsewhere in this document. Numbering, icons and drawing conventions used shall be consistent throughout all documentation provided.

PART 3 - EXECUTION

3.1 IDENTIFICATION AND LABELING

A. Cable Labeling: Backbone **and horizontal cables** shall be labeled at each end.

1. Provide additional cable labeling at each manhole and pull box.
2. Cables that are routed through multiple pathway segments shall contain reference to all pathway segments in the pathway linkage field.
3. Cables that differ only by performance class shall have a suitable marking or label to indicate the higher performance class. For example, station cabling utilizing the blue color, may include blue with a white stripe to indicate the higher performance class station cabling.

B. Information Outlet Labeling: Tag all voice and data jacks as defined herein.

C. Termination Hardware Labeling:

1. An identifier shall be provided at each termination hardware location or its label.

D. Grounding/Bonding Labeling:

1. The TMGB shall be labeled "TMGB." There shall be only one TMGB in the facility.
2. Label all TBB conductors connecting to the TMGB with a unique label, located at both ends of the TBB.
3. Each TGB shall be labeled with a unique label.
4. All TBB conductors connecting to the TGB shall be labeled uniquely at each end of the cable.

END OF SECTION 27 05 53

SECTION 27 11 00 - COMMUNICATION EQUIPMENT ROOMS (CER)

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section describes the products and execution requirements related to furnishing and installing equipment for communication equipment rooms.

1.2 RELATED WORK

A. Section 27 05 00 - Basic Communications Systems Requirements

B. Section 27 05 26 - Communications Bonding

C. Section 27 05 28 - Interior Communication Pathways

D. Section 27 15 00 - Horizontal Cabling Requirements

1.3 QUALITY ASSURANCE

A. Refer to Section 27 05 00 for applicable standards.

1.4 SUBMITTALS

A. Under the provisions of Section 27 05 00 and Division 1, prior to the start of work the Contractor shall submit:

1. Manufacturer's data covering all products including construction, materials, ratings and all other parameters identified in Part 2 - Products, below.
2. Manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 EQUIPMENT GROUNDING

A. Refer to specification section 27 05 26 for grounding requirements.

B. All equipment required to be grounded shall be provided with a grounding lug suitable for termination of the specified size electrode conductor.

2.2 EQUIPMENT RACKS AND CABINETS

A. Where identified on the drawings in Communication Equipment Rooms, equipment racks and/or equipment cabinets shall be furnished and installed by the Contractor to house cable termination components (e.g., copper, optical fiber, coax) and network electronics.

B. The equipment rack shall conform to the following requirements:

1. Standard TIA/EIA 19" Floor Rack:

a. Equipment rack shall be 84" in height, self-supporting and provide a useable mounting height of 45 rack units (RU) (1 RU = 1 3/4").
b. Channel uprights shall be spaced to accommodate industry standard 19" mounting.
c. Equipment rack shall be double side drilled and tapped to accept 12-24 screws. Uprights shall also be drilled on back to accept cable brackets, clamps, power strip(s), etc. Hole pattern on rack front shall be per TIA/EIA specifications (5/8"-5/8"-1/2"). Hole pattern on the rear shall be at 3" intervals to accept cable brackets.
d. Equipment racks shall be provided with a supply of spare screws (minimum of 24).
e. Equipment racks shall be provided with a ground bar and #6 AWG ground lug.
f. Provide all mounting hardware and accessories as required for a complete installation.

2.3 CABLE MANAGEMENT - **VERTICAL AND** HORIZONTAL

A. Equipment Racks:

1. Equipment racks shall be equipped with vertical and horizontal cable management hardware in the form of rings and guides. Racks shall incorporate vertical and horizontal covers, to allow an orderly, hidden, routing of copper, optical fiber, and coax jumpers from the modular patch panels and/or 110-type termination blocks to the customer provided network electronics. Vertical and horizontal cable management hardware shall be as follows:

a. Horizontal cable management hardware shall be 16 gauge cold rolled steel construction with six (6) pass-thru holes and seven (7) front-mounted 3.5" steel rod D-rings. Provide with cover designed to conceal and protect cable.
b. At a minimum, horizontal cable management hardware shall be positioned above and below (a) each grouping of two rows of jacks on modular patch panels, and (b) above and below each optical fiber patch panel and (c) each grouping of two rows of F-type connectors on coax patch panels.
c. Vertical cable management hardware shall provide for cable routing on front and rear of each rack and be 14" deep x 6" wide (minimum). Where multiple equipment racks are to be installed, this hardware shall be mounted between the uprights of adjacent equipment racks. Equipment rack uprights and the spacers shall be secured together per manufacturer's recommendations. Provide with cover designed to conceal and protect cable.

2. Each equipment rack shall be supplied with a minimum of 12 releasable (e.g., "hook and loop") cable support ties.

3. Where cable termination hardware is wall-mounted, the Contractor shall be responsible for establishing a cable pathway for jumpers routed from the equipment rack(s) to the wall. This shall be in the form of slotted ducts or troughs. Routing of jumpers via the overhead cable tray or ladder rack system is NOT acceptable. The proposed method shall be included in the submittals required by this document and shall be approved by the Architect/Engineer prior to installation.

2.4 PATCH PANELS

A. Where identified on the drawings in Communication Equipment Rooms, modular patch panels shall be furnished and installed by the Contractor for termination of copper cable.

B. Copper cabling shall be terminated in Communication Equipment Rooms on modular patch panels consisting of a modular connector system incorporating modular jacks meeting the specifications for the jacks detailed in Section 27 15 00.

C. Wall-mounted modular patch panels shall incorporate a standoff bracket to allow copper cabling to be routed behind the modular patch panel.

D. The largest single modular patch panel configuration shall not exceed 48-Ports. Modular patch panels shall be fully populated (all ports occupied by jacks) and be provided in increments of no less than 12 jacks. High-density modular patch panels will not be accepted.

E. The modular patch panel blocks shall have the ability to seat and cut eight (8) conductors (4 pairs) at a time and shall have the ability of terminating 22- through 26-gauge plastic insulated, solid and stranded copper conductors. Modular patch panel blocks shall be designed to maintain the cables' pair twists as closely as possible to the point of mechanical termination.

F. Modular patch panels shall incorporate cable support and/or strain relief mechanisms to secure the horizontal cables at the termination block and to ensure that all manufacturers minimum bend radius specifications are adhered to.

2.5 OPTICAL FIBER PANELS

A. All terminated optical fibers shall be mated to simplex **LC**-type couplings mounted on enclosed fiber distribution cabinets. Couplings shall be mounted on a panel that, in turn, snaps into the enclosure. The proposed enclosure shall be designed to accommodate a changing variety of connector types including SC, ST, Fixed Shroud Duplex (e.g., "FDDI Connector"), Biconic, FC, and MT-RJ by changing panels on which connector couplings are mounted.

B. The fiber distribution cabinet shall be sized to accommodate the total fiber count to be installed at each location as defined in the specifications and drawings, including those not terminated (if applicable). Connector panels and connector couplings (sleeves, bulkheads, etc.) adequate to accommodate the number of fibers to be terminated shall be furnished and installed by the Contractor.

C. The fiber distribution cabinet shall be an enclosed assembly affording protection to the cable subassemblies and to the terminated ends. The enclosures shall incorporate a hinged or retractable front cover designed to conceal and protect the optical fiber couplings, connectors, and cable.

D. Access to the inside of the fiber distribution cabinet's enclosure during installation shall be from the front and/or rear. Panels that require any disassembly of the fiber distribution cabinet to gain entry will not be accepted.

E. The fiber distribution cabinet's enclosure shall provide for strain relief of incoming optical fiber cables and shall incorporate radius control mechanisms to limit bending of the optical fiber to the manufacturer's recommended minimums or ½", whichever is larger.

F. All fiber distribution cabinets shall provide protection to both the "facilities" and "user" side of the coupling. The fiber distribution cabinet's enclosure shall be configured to require front access only when patching. The incoming optical fiber cables (e.g., backbone, riser, horizontal, etc.) shall not be accessible from the patching area of the panel. The fiber distribution cabinet's enclosure shall provide a physical barrier to access such optical fiber cables.

G. Where "Loose Buffered" cables are installed, the 250 µm coated optical fibers contained in these cables may be terminated either by (1) splicing of factory-terminated cable assemblies ("pigtails") or (2) the use of a "fan-out" kit. In the latter approach, individual fibers are to be secured in a protective covering, an Aramid (e.g., Kevlar™) reinforced tube for example, with connectors mated to the resulting assembly. In both instances, the proposed termination hardware shall incorporate a mechanism by which cable and subassemblies are secured to prevent damage. Splicing shall be by the "fusion" method. Individual splice loss shall not exceed 0.3 dB for multi-mode fibers. Direct termination of 250 µm coated optical fibers shall not be permitted.

H. Fiber distribution cabinets for horizontal cabling: Where optical fiber horizontal cabling is to be terminated, the enclosure shall be compliant to all the above requirements plus the enclosure shall incorporate a storage mechanism designed to allow simplified identification, access to and termination of individual optical fibers. This may be in the form of a storage cassette, tray or other appropriate mechanism.

2.6 OPTICAL FIBER COUPLERS/ADAPTERS

A. Optical Fiber Couplings (LCtype) (Multimode/Singlemode):

1. LC-type optical fiber couplings shall be used to terminate optical fiber backbone cable on fiber distribution cabinet panels in communication equipment rooms. Horizontal optical fiber cables shall also be terminated using optical fiber couplings at their designated work area locations on information outlet faceplates for "fiber to the desk."
2. LC-type optical fiber couplings shall be snap-type with locking washer and nut.
3. LC-type optical fiber couplings shall incorporate domed zirconia ferrule and shall utilize a PC polish to ensure fiber-to-fiber physical contact for low loss and reflections.

4. LC-type optical fiber couplings shall accept 125-micron outside diameter multimode fiber.
5. The attenuation per mated pair shall not exceed 0.7 dB (individual) and 0.5 dB (average). Connectors shall sustain a minimum of 200 mating cycles per TIA/EIA-455-21 without violating specifications.
6. LC-type optical fiber couplings shall meet the following performance criteria:

Test Procedure	Maximum Attenuation Change
Cable Retention (FOTP-6)	0.2 dB
Durability (FOTP-21)	0.2 dB
Impact (FOTP-2)	0.2 dB
Thermal Shock (FOTP-3)	0.2 dB
Humidity (FOTP-5)	0.2 dB

7. Performance Requirements:

    a. Length: 2 inches
    b. Operating Temperature: -40 to 85 degrees C

8. Basis of Design:

    a. Hubbell

2.7 TERMINATION BLOCKS

A. Where identified on the drawings in Communication Equipment Rooms, 110-type termination blocks shall be furnished and installed by the Contractor for termination of copper cable.

B. Each horizontal row of the 110-type termination block must be capable of terminating one (1) 25-pair binder group (backbone cables)

C. The Mechanical Termination Shall:

1. Have the ability of terminating 22 - 26 AWG plastic insulated, solid and stranded copper conductors.
2. Provide a direct connection between the cable and jumper wires.
3. Have less than 0.2 dB of attenuation from 1-16 MHz.
4. Have less than 100 mW of DC resistance.
5. Have less than 5 mw of resistance imbalance.
6. Have minimal signal impairments at all frequencies up to 16 MHz.

D. The 110-type termination block shall identify pair position by a color designation - Blue, Orange, Green, Brown and Slate (backbone only).

E. The 110-type termination block shall be designed to maintain the cables' pair twists as closely as possible to the point of mechanical termination.

2.8 LADDER RACK

A. Provide complete ladder rack system including metallic ladder rack, splice connectors, fastening hardware and other miscellaneous materials as required for a complete installation per manufacturer's recommendations.

B. Tubing Style Ladder Rack:

1. Rolled steel siderail stringer, minimum 1.5" stringer height, 9" spaced welded rungs.
2. Steel shall meet the requirements of ASTM A1011 SS Grade 33.
3. Loading limits shall be 185 lbs/ft for 4 ft spans.

C. Ladder rack finish shall be flat black powder coat.

2.9 POWER STRIPS

A. Provide power strips on all equipment racks, unless noted otherwise. These power strips shall have the following characteristics:

1. Standard Rack Mount:

a. TIA/EIA 19" equipment rack mountable.
b. Compliant with UL-1449 Third Edition and UL-497A.
c. Provide transient suppression to 12,000-A. Protection shall be in all three modes (line-neutral, line-ground and neutral-ground).
d. Shall meet or exceed ANSI C62 Category A3 requirements.
e. Provide high-frequency noise suppression as follows:

1) Greater than 20-dB @ 50 kHz
2) Greater than 40-dB @ 150 kHz
3) Greater than 80-dB @ 1 MHz
4) Greater than 30-dB @ 6 to 1000 MHz

f. Protection Modes and UL 1449 Clamping Voltage: 475 volt L-N, L-G, and N-G.
g. Components: Nonmodular units composed of 20mm metal oxide varistors (MOV). Series inductors, SAD, or selenium cells may be used in addition to MOVs.
h. Be equipped with a 10-foot power cord.
i. Provide with raised floor twistlock compatible.

2.10 COPPER PATCH CORDS

A. Modular Patch Panel:

1. Provide Category 6 Enhanced copper patch cords for 70% of all assigned ports on the modular patch panel. Of these cords, 60% shall be 3' in length and 40% shall be 5' in length. These patch cords shall be the cross-connect between the network electronics and the horizontal RJ-45 modular patch panel. Copper patch cords shall be equipped with a 4-pair RJ-45 connector on each end.

2. Refer to Section 27 15 00 for cable and connector performance requirements.
3. Patch cords shall not be made-up in the field.
4. Basis of Design (Refer to 27 17 20 for Acceptable Manufacturers):

    a. Hubbell HC Series

2.11 FIBER PATCH CORDS

A. Optical Fiber Patch Cords (Multimode):

1. Provide 50/125 mm multimode (MM) optical fiber utilizing tight buffer construction for 50% of all assigned ports on the fiber distribution cabinet. These patch cords shall be the cross-connect between the backbone fiber distribution cabinet and the Owner's network electronics (hub/switch). Optical fiber patch cords shall be equipped with a ceramic tipped **LC**-type connector on each end and shall be a minimum of 5 feet in length. Connector body shall be of materials similar to that used in the proposed couplings. Provide required lengths as determined on the plans.
2. Channels shall be of equal length.
3. Refer to Section 27 15 00 for cable and connector performance requirements.
4. Basis of Design (Refer to 27 17 20 for Acceptable Manufacturers):

    a. Hubbell DFPC Series

PART 3 - EXECUTION

3.1 EQUIPMENT RACKS

A. Equipment racks shall be furnished and installed as shown on the drawings.

B. The Contractor shall bolt the rack to the floor as recommended by the manufacturer. Multiple racks shall be joined and the ground made common on each. The rack shall be stabilized by extending a brace to the wall. Alternately, overhead ladder rack by which the cabling accesses the equipment rack(s) may provide this function.

C. A space between the rack upright and the wall (approximately 4") should be provided to allow for cabling in that area. The rear of the rack should be approximately 40" from the wall to allow for access by maintenance personnel. In all cases, a minimum of 40" workspace in front of the rack is also required. Locations where these guidelines cannot be followed should be brought to the attention of the Architect/Engineer for resolution prior to installation.

D. All hardware and equipment is to be mounted between 18" and 79" above floor level. This is to afford easy access and, in the case of the lower limit, prevent damage to the components. Positioning of hardware should be reviewed and approved by the Architect/Engineer and Site Coordinator(s) prior to installation.

E. Equipment racks shall be equipped with cable management hardware as to allow an orderly and secure routing of optical fiber and/or copper cabling to the optical fiber distribution cabinets and/or modular patch panels. At minimum, one such horizontal jumper management panel shall be placed below each optical fiber distribution cabinet installed by the Contractor. Additional Jumper Management panels may be required pending installation of other cable types on the equipment rack.

F. Each rack shall be grounded to the Telecommunications Ground Bar (GND) using a #6 AWG (or larger) insulated stranded copper conductor (GREEN jacket) directly or via an adjacent grounded equipment rack. Refer to grounding requirements below.

3.2 LADDER RACK

A. Provide support for ladder rack on 4 ft centers.

B. Maintain a 1.5 safety factor on all load limits specified herein.

C. Ladder rack support shall be by 5/8" diameter threaded rod when ceiling mounted. Ladder rack requiring wall mounting shall utilize accessories supplied by the ladder rack manufacturer specifically for the purpose of wall mounting ladder rack.

3.3 GROUNDING

A. Provide a complete grounding system in accordance with the requirements of Section 27 05 26.

3.4 CROSS CONNECT INSTALLATION

A. Bend radius of cable shall not exceed 4 times the outside cable diameter or manufacturer's recommendation, whichever is less.

B. Cables shall be neatly bundled and dressed to their respective panels and/or blocks. Each shall be fed by an individual bundle separated and dressed to the point of cable entrance into the rack and/or frame.

C. The cable jacket shall be maintained as close as possible to the termination point.

D. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that is visible without removing the bundle support.

3.5 CONDUITS AND CABLE ROUTING

A. Refer to Section 26 05 33 for additional requirements.

B. Where conduits enter a telecommunications room, conduits shall be terminated on the wall where shown on the contract documents. Conduits entering the room from the floor shall extend 3" above the floor slab.

C. Where cabling rises vertically in a telecommunications rooms, provide vertical cable management to support the cabling from floor to ceiling level.

D. All conduits shall be reamed and shall be installed with a nylon bushing.

E. Maintain appropriate conduit bend radius at all times. For conduits with an internal diameter of 2" or less, maintain a bend radius of at least 6 times the internal diameter. For conduits with an internal diameter greater than 2", maintain a bend radius of at least 10 times the internal diameter.

END OF SECTION 27 11 00

SECTION 27 13 00 - BACKBONE CABLING REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section describes the products and execution requirements relating to furnishing and installing backbone communications cabling and termination components and related subsystems as part of a cabling plant. The cabling plant consists of both optical fiber and/or copper cabling.

1.2 RELATED WORK

A. Section 27 05 00 - Basic Technology Systems Requirements.

B. Section 27 15 00 - Horizontal Cabling Requirements.

1.3 QUALITY ASSURANCE

A. Refer to Section 27 05 00 for relevant standards.

1.4 SUBMITTALS

A. Under the provisions of Section 27 05 00 and Division 1, prior to the start of work the Contractor shall submit:

1. Manufacturer's data covering all products proposed, including construction, materials, ratings and all other parameters identified in Part 2 - Products, below.

PART 2 - PRODUCTS

2.1 GENERAL

A. The basis of design is listed herein. Refer to Section 27 17 20 for additional acceptable manufacturers.

2.2 OPTICAL FIBER BACKBONE - INSIDE PLANT

A. Multimode (MM)/Singlemode (SM):

1. This optical fiber backbone cable shall be suitable for installation in building riser systems, in conduit, in cable tray and/or in innerduct.
2. Optical fiber cable materials shall be all dielectric (no conductive material).
3. Optical fiber cable shall carry an OFNR (optical fiber non-conductive riser) or OFNP (optical fiber non-conductive plenum) rating. Refer to Section 27 05 00 for project requirements.
4. Optical fiber cable shall be interlocking armored cable.

5. Outer Sheath: The outer sheath shall be marked with the manufacturer's name, date of manufacture, fiber type, flame rating, UL symbol, and sequential length markings every two feet.
6. Temperature Range:

    a. Storage: -40°C to +70°C (no irreversible change in attenuation).
    b. Operating: -40°C to +70°C.

7. Humidity Range: 0% to 100%.
8. Maximum Tensile Strength (≥ 12 fibers):

    a. During Installation: 1332 N (300 lb. force) (no irreversible change in attenuation).
    b. Long-Term: 600 N (135 lb. force).

9. Maximum Tensile Strength (≤ 6 fibers):

    a. During Installation: 1000 N (225 lb. force) (no irreversible change in attenuation).
    b. Long-Term: 100 N (67 lb. force).

10. Bending Radius:

    a. During Installation: 20 times cable diameter.
    b. No Load: 10 times cable diameter.

B. Optical fiber cables suitable for installation in multiple environments (e.g., underground duct and building risers) may be used at the Contractor's option. Such optical fiber cables shall meet all specifications noted above for cables designated for each environment through which the optical fiber cable shall pass.

C. Basis of Design (OM3 Multimode):

1. Hubbell OM3 (HFCD15xxx series).
2. Additional acceptable manufacturers.

    a. Corning

Test Procedure	Maximum Attenuation Change
Cable Retention (FOTP-6)	0.2dB
Durability (FOTP-21)	0.2dB
Impact (FOTP-2)	0.2dB
Thermal Shock (FOTP-3)	0.2dB
Humidity (FOTP-5)	0.2dB

Test Procedure	Maximum Attenuation Change
Cable Retention (FOTP-6)	0.2dB
Durability (FOTP-21)	0.2dB
Impact (FOTP-2)	0.2dB
Thermal Shock (FOTP-3)	0.2dB

Humidity (FOTP-5) 0.2dB

2.3 OPTICAL FIBER BACKBONE PERFORMANCE

A. OM3 Multimode (MM):

1. Fiber Type: Multimode; doped silica core surrounded by a concentric glass cladding.
2. Index Profile: Graded Index.
3. Transmission Windows: 850-nm and 1300-nm.
4. Core Diameter (nom): 50-□m (microns) ± 2.5.
5. Cladding Diameter: 125-□m ± 1.
6. Core-clad Concentricity: ≤ 1.0-□m.
7. Cladding Non-circularity: ≤ 1.0%.
8. Fiber Coating Diameter:

    a. 245-□m ± 10 (primary coating).
    b. 900-□m (nominal) secondary coating (tight buffer)
    c. All coatings shall be mechanically strippable without damaging the optical fiber.

9. Attenuation (maximum @ 23 ± 5°C; backbone):

    a. @ 850-nm: 3.0 dB/km.
    b. @ 1300-nm: 1.0 dB/km.
    c. @ 1300-nm thru 1380-nm: 1.0dB/km

        1) When tested in accordance with FOTP-3, "Procedure to Measure Temperature Cycling Effects on Optical Fibers, Optical Cable, and Other Passive Fiber Optic Components," the average change in attenuation over the rated temperature range of the optical cable shall not exceed 0.50 dB/km with 80% of the measured fibers not exceeding 0.25 dB/km.

10. Bandwidth (minimum):

    a. @ 850-nm: 2000 MHz*km.
    b. @ 1300-nm: 500 MHz*km.

11. No optical fiber shall show a point discontinuity greater than 0.2 dB at the specified wavelengths. Such a discontinuity or any discontinuity showing a reflection at that point shall be cause for rejection of that optical fiber by the Owner.

PART 3 - EXECUTION

3.1 CABLE INSTALLATION REQUIREMENTS

A. Cable slack shall be provided in each backbone fiber optic cable. This slack is exclusive of the length of fiber that is required to accommodate termination requirements and is intended to provide for cable repair and/or equipment relocation. The cable slack shall be stored in a fashion as to protect it from damage and be secured in the termination enclosure or a separate enclosure designed for this purpose. Multiple cables may share a common enclosure.

B. A minimum of 5 meters (approximately 15 feet) of slack cable (each cable if applicable) shall be coiled and secured at both ends located in the entrance room, Telecommunications Room or main equipment room, for backbone and intra-building cable.

C. Where exposed, all backbone fiber optic cable shall be installed in protective inner duct. This includes areas where the cable is routed in cable tray and where making a transition between paths (e.g., between conduit and cable tray or into equipment racks). The inner duct should extend into the termination and/or storage enclosure(s) at system endpoints.

3.2 CROSS-CONNECTS

A. The **Owner** will be responsible for all cross-connects between the data backbone cabling and network electronics and between the data network electronics and horizontal cabling.

B. The **Contractor** shall be responsible for the cross-connect wiring between the horizontal and backbone voice cabling.

1. All four (4) pairs of the horizontal cable shall be terminated on modular patch panels. Two (2) pairs of the horizontal cable shall be cross-connected to the backbone cable. Refer to the drawings for requirements of the 110 to RJ-45 cross connect cable.
2. All four (4) pairs in each horizontal cable shall be terminated on 110-type termination blocks in a field dedicated for horizontal cabling. Two (2) pairs of the horizontal cable shall be cross-connected to the backbone cable. 2-pair cross-connect wire, color-coded to identify each pair, shall be used. The 25TH pair position (50th, 75th, etc.) of each riser voice block shall remain vacant.
3. Fastening cables directly to support brackets with wire or plastic ties will not be accepted. All cabling shall be neatly laced, dressed and supported. Avaya 88A retainer clips (or equivalent) shall be used on each 110-type termination block to secure jumper wires on the wiring block(s).

C. This Contractor shall be responsible for cross-connects between the cabling terminations at the Entrance Room and the telephone utility network point-of-presence. It shall be the responsibility of the Contractor, to work with the Owner and provide the necessary assistance to allow Owner and/or telephone company personnel to make the necessary connections to establish service on the new cable system. These activities include, but are not limited to cross-connect documentation, general wiring overview and cable pair identification.

END OF SECTION 27 13 00

SECTION 27 15 00 - HORIZONTAL CABLING REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section describes the products and execution requirements relating to furnishing and installing horizontal communications cabling and termination components and related subsystems as part of a cabling plant. The cabling plant consists of copper cabling.

1.2 RELATED WORK

A. Section 27 05 00 - Basic Communications Systems Requirements

B. Section 27 17 20 - Structured Cabling System Warranty

1.3 QUALITY ASSURANCE

A. Refer to Section 27 05 00 for relevant standards and plenum or non-plenum cable requirements.

B. The channel shall be required to meet the performance requirements indicated herein. The manufacturer shall warranty the performance of their system to the required performance (and not just to the Standard, should the required performance exceed the Standard).

C. Specific components of the channel shall be required, at a minimum, to meet the Standard component requirements for that particular component.

D. The installing contractor must be certified by the manufacturer of the structured cabling system.

1.4 SUBMITTALS

A. Under the provisions of Section 27 05 00 and Division 1, prior to the start of work the Contractor shall submit:

1. Manufacturer's data covering all products proposed, including construction, materials, ratings and all other parameters identified in Part 2 - Products, below.

PART 2 - PRODUCTS

2.1 HORIZONTAL CABLE

Test Parameter	100 MHz	250 Mhz
Attenuation:	22.0 dB	36.9 dB
NEXT:	35.3 dB	31.3 dB

Test Parameter	100 MHz	250 Mhz
PS NEXT:	32.3 dB	28.3 dB
ACR:	13.3 dB	-5.5 dB
PS ACR:	N/A	-8.5 dB
ELFEXT:	23.8 dB	18.8 dB
PS ELFEXT:	20.8 dB	15.8 dB
Return Loss:	20.1 dB	17.3 dB
Propagation Delay:	548 ns	N/A
Delay Skew:	50 ns	25 ns

Test Parameter	100 MHz	150 Mhz
Attenuation:	24.0 dB	30.1 dB
NEXT:	30.1 dB	28.5 dB
PS NEXT:	27.1 dB	25.5 dB
ACR:	6.1 dB	-1.5 dB
PS ACR:	3.1 dB	-4.5 dB
ELFEXT:	17.4 dB	16.3 dB
PS ELFEXT:	14.4 dB	13.3 dB
Return Loss:	10.0 dB	8.2 dB

A. CAT 6 Enhanced Cable:

1. The horizontal cable requirements must be met as well as the following channel requirements.
2. CAT 6 cable shall terminate on rack-mounted modular patch panels in their respective communication equipment room as indicated on the drawings.
3. Performance Tests shall be conducted using swept frequency testing through 250 MHz for the channel. All numbers given are for a 4-connection channel. Discrete frequency testing results at 250 MHz is not acceptable.
4. Performance data shall be characterized as "Guaranteed Headroom" and shall be guaranteed by the manufacturer to perform at guaranteed margins over ANSI/TIA/EIA-568-C.2. Performance data that is not warranted by the manufacturer will not be considered.
5. The structured cabling and connectivity must be provided by the same company. For the purpose of this specification that shall mean that the cabling and connectivity must be marketed, branded, supported, warranted, and distributed by the same company. Specifically, ally or partnerships between cabling manufacturers and connectivity manufacturers do not meet this requirement unless otherwise listed in Section 27 17 20 as an acceptable manufacturer. Specifically, products made by others through an OEM relationship are acceptable if the products are marketed, branded, supported, warranted, and distributed by the same company.
6. The 4-connector channel performance margins in the table below shall be guaranteed margins above ANSI/TIA/EIA-568-C.2:

Electrical Value (1 - 250 MHz)	Minimum Margin

Electrical Value (1 - 250 MHz)	Minimum Margin
Insertion Loss:	14.0%
NEXT:	7.0 dB
PS NEXT:	8.0 dB
ACR-F (ELFEXT):	8.0 dB
PS ACR-F (PS ELFEXT):	8.0 dB
Return Loss:	4.0 dB

7. The jacket color for CAT 6 cable shall be **blue** for data applications.
8. Basis of Design:

    a. Hubbell C6ESP Series
    b. Additional acceptable manufacturers:
        1) Belden
        2) Berk-Tek
        3) General Cable
        4) Panduit
        5) Siemon
        6) Superior Essex

Electrical Value (1 - 250 MHz)	Minimum Margin
Insertion Loss:	5%
NEXT:	3.0 dB
PS NEXT:	5.0 dB
ACR-F (ELFEXT):	4.0 dB
PS ACR-F (PS ELFEXT):	5.0 dB
Return Loss:	2 dB

Electrical Value (1 - 500 MHz)	Minimum Margin
Insertion Loss:	3%
NEXT:	2 dB
PS NEXT:	3 dB
PSA NEXT:	3 dB
PSA NEXT (Average):	
ACR-F:	2 dB
PS ACR-F:	3 dB
PSA ACR-F:	3 dB
PSA ACR-F (Average):	3 dB
Return Loss:	2 dB

2.2 CONNECTORS/COUPLERS/ADAPTERS

A. Refer to Section 27 11 00 for requirements and 27 13 00 for requirements.

B. Coax (F-Connector):

1. RG-6 coax cable shall be terminated at the work area and at communication equipment rooms in a male F-type connector.
2. The male F-type connector shall:

    a. Be matched to the RG-6 coax cable type proposed by the Contractor.
    b. Be a single-piece F-type connector.
    c. Incorporate a 1/2" crimp ring which uses hex crimp.

3. The male F-type connectors shall be mated to female/female feed-thru couplings at both the information outlet and modular patch panel locations. These couplings shall be matched to the male F-type connector. Couplings shall be of sufficient length as to allow for the male F-type connector to fully seat (both sides).

2.3 FACEPLATES/JACKS

A. CAT 6 Jacks:

1. CAT 6 horizontal cable shall each be terminated at their designated work area location on RJ-45 modular jacks. These modular jack assemblies shall snap into a modular mounting frame. The combined modular jack assembly is referred to as an information outlet.
2. The same orientation and positioning of modular jacks shall be utilized throughout the installation. Prior to installation, the Contractor shall submit the proposed configuration for each information outlet type for review by the Architect/Engineer.
3. Information outlet faceplates shall incorporate recessed designation strips at the top and bottom of the frame for identifying labels. Designation strips shall be fitted with clear plastic covers.
4. Where standalone CAT 6 only modular jacks are identified, the information outlet faceplate shall be configured as to allow for the addition of one (1) additional modular jack (CAT 3, CAT 5E, or CAT 6) to be installed to supplement each such modular jack as defined by this project. The installation of these supplemental modular jacks is NOT part of this project.
5. Any unused modular jack positions on an information outlet faceplate shall be fitted with a removable blank inserted into the opening.
6. All modular jacks will be fitted with a dust cover. Modular jacks shall incorporate a dust cover that fits over and/or into the modular jack opening. The dust cover shall be designed to remain with the modular jack assembly when the modular jack is in use. No damage to the modular jack pinning shall result from insertion or removal of these covers. Dust covers that result in deformation of the modular jack pinning, will not be accepted.
7. The information outlet faceplate shall be constructed of high impact plastic (except where noted otherwise). The information outlet faceplate color shall:

a. Match the receptacle color used for other utilities in the building, or
b. When installed in surface raceway (if applicable), match the color of that raceway.

8. Different faceplate and frame designs for locations, which include optical fiber cabling relative to those, that terminate only copper cabling are acceptable. Information outlets that incorporate optical fiber shall be compliant with the above requirements plus:

    a. Be a low-profile assembly.
    b. Incorporate a mechanism for storage of cable and fiber slack needed for termination.
    c. Position the optical fiber couplings to face downward or at a downward angle to prevent contamination.
    d. Incorporate a shroud that protects the optical fiber couplings from impact damage.

9. All information outlets and the associated modular jacks shall be of the same manufacturer throughout the project.
10. The CAT 6 modular jacks shall be non-keyed 8-pin modular jacks.
11. The interface between the modular jack and the horizontal cable shall be a 110-type termination block or insulation displacement type contact. Termination components shall be designed to maintain the horizontal cable's pair twists as closely as possible to the point of mechanical termination.
12. CAT 6 modular jacks shall be pinned per TIA-568B.
13. CAT 6 termination hardware shall, as a minimum, meet all the mechanical and electrical performance requirements of the following standards:

    a. ANSI/TIA/EIA-568-A-5
    b. ANSI/TIA/EIA-568A
    c. ISO/IEC 11801
    d. IEC 603-7
    e. FCC PART 68 SUBPART F

14. The color for CAT 6 jacks shall be blue for data applications. Alternately, a color-coded bezel or icon may be used to identify the CAT 6 modular jack.

2.4 RG-6 BROADBAND RF COAXIAL CABLE

A. Basic Construction:

1. Center conductor: 18 AWG bare copper covered steel; 0.040" OD (nominal); foamed polyethylene dielectric.
2. Four Layer Shield:

    a. Inner shield: aluminum-polypropylene-aluminum laminated tape with overlap bonded to dielectric.
    b. Second shield: 60% 34 AWG bare aluminum braid wire.
    c. Third shield: non-bonded aluminum foil tape.
    d. Outer shield: 40% 34 AWG bare aluminum braid wire.

B. Electrical Performance Characteristics:

1. Impedance: 75 ohms.
2. Velocity of propagation: å? 82%.
3. Maximum attenuation (per 100 feet) for non-plenum rated cable:

   a. at 55-MHz: 1.60 dB
   b. at 450-MHz: 4.26 dB
   c. at 750-MHz: 5.59 dB
   d. at 1000-MHz: 6.54 dB

4. Maximum attenuation (per 100 feet) for plenum-rated cable:

   a. at 50-MHz: 1.60 dB
   b. at 400-MHz: 4.60 dB
   c. at 700-MHz: 6.60 dB

C. at 1000-MHz: 8.20 dBAcceptable Manufacturers:

1. Belden 1189A series
2. CommScope
3. West Penn
4. Times Fiber

2.5 COPPER WORK AREA CORDS

A. RJ-45:

1. Provide the same quantity of **Category 6** copper work area cords as copper patch panel cords specified in Section 27 11 00. Copper work area cords shall be equipped with an 8-pin modular RJ-45 connector on each end.
2. Work area cords shall be **6'** in length.
3. Manufacturer of copper patch cable shall be the same as the manufacturer of the horizontal copper cable.

B. RG-6 Broadband RF Coaxial with F-Connectors:

1. Provide one (1) coaxial work area cable for each CATV information outlet location installed.
2. Coaxial work area cables shall consist of quad-shielded RG-6 broadband RF coaxial cable meeting electrical performance characteristics specified earlier in this section, and be equipped with compression-style F-connectors on each end.
3. Work area cords shall be **3** feet in length.

PART 3 - EXECUTION

3.1 CABLE INSTALLATION REQUIREMENTS

A. Horizontal Cabling:

1. The maximum horizontal cable drop length for Data UTP shall not exceed 295 feet (90 meters) in order to meet data communications performance specifications. This length is measured from the termination panel in the wiring closet to the outlet and must include any slack required for the installation and termination. The Contractor is responsible for installing horizontal cabling in a fashion so as to avoid unnecessarily long runs. Any area that cannot be reached within the above constraints should be identified and reported to the Architect/Engineer prior to installation. Changes to the contract documents shall be approved by the Architect/Engineer.
2. All cable shall be free of tension at both ends. In cases where the cable must bear some stress, Kellum grips may be used to spread the strain over a longer length of cable.
3. Manufacturer's minimum bend radius specifications shall be observed in all instances.
4. Horizontal cabling installed as open cabling shall be supported at a maximum of 5' between supports. Refer to the specifications for required cable supports.
5. Horizontal cabling installed as open cable or in cable tray shall be bundled at not less than 10' intervals with hook-and-loop tie wraps. The use of plastic cable ties is strictly prohibited.
6. The maximum conduit fill for horizontal cabling shall not exceed 40% regardless of conduit length.
7. Cable sheaths shall be protected from damage from sharp edges. Where a cable passes over a sharp edge, a bushing or grommet shall be used to protect the cable.

B. A coil of 3 feet in each cable shall be placed in the ceiling at the last support (e.g., J-hook, bridle ring, etc.) before the cables enter a fishable wall, conduit, surface raceway or box. At any location where cables are installed into movable partition walls or modular furniture via a service pole, approximately 15-feet of slack shall be left in each horizontal cable under 250 feet in length to allow for change in the office layout without re-cabling. These "service loops" shall be secured at the last cable support before the cable leaves the ceiling and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.

1. To reduce or eliminate EMI, the following minimum separation distances from 480V power lines shall be adhered to:

    a. Twelve (12) inches from power lines of less than 5-kVa.
    b. Eighteen (18) inches from high-voltage lighting (including fluorescent).
    c. Thirty-nine (39) inches from power lines of 5-kVa or greater.
    d. Thirty-nine (39) inches from transformers and motors.

2. Information outlets shown on floor plans with the subscript "W" are intended to be used for wall mounted telephones. Back boxes for wall mounted telephones shall not be located within 12" vertically, or horizontally, from any light switches, power receptacles, nurse call devices, thermostats, or any other architectural element that would otherwise prevent the installation of a wall mounted telephone on the mating lugs.

3.2 CABLE TERMINATION REQUIREMENTS

A. Cable Terminations - Data UTP:

1. Modular patch panels shall be designed and installed in a fashion as to allow future horizontal cabling to be terminated on the panel without disruption to existing connections.
2. If the "last" patch (per rack) is greater than 50% utilized, one additional patch panel shall be provided for future use. Modular patch panels shall be sized to accommodate a minimum of ten (10) additional drops.
3. At information outlets and modular patch panels, the Contractor shall ensure that the twists in each cable pair are preserved to within 0.5-inch of the termination for data cables. The cable jacket shall be removed only to the extent required to make the termination.

B. Cable Terminations - RG-6 and RG-11 Coax:

1. Directional coupler / taps shall be sized to accommodate an additional 20% growth in the number of cables terminated at any given location. Unused directional coupler / tap ports shall be terminated with a 75-Ohm F-type terminator.
2. All cables shall be terminated in the specified connector type and mated directly to wall-mounted directional coupler / taps. Coaxial cables shall be dressed neatly and secured to D-rings per manufacturer guidelines.
3. When preparing the RG-6 and RG-11 coaxial cable for termination, manufacturer's installation procedures shall be adhered to. Special care shall be taken to ensure the proper center conductor length as specified by the manufacturer.
4. All coaxial cable connectors shall be mated to the cable using only the appropriate purpose-designed tools recommended by the manufacturer for that purpose.

END OF SECTION 27 15 00

SECTION 27 17 10 - TESTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section describes the testing requirements relating to the structured cabling system and its termination components and related subsystems.

1.2 RELATED WORK

A. Section 27 05 00 - Basic Communications Systems Requirements

1.3 QUALITY ASSURANCE

A. Refer to Section 27 05 00 for relevant standards.

1.4 SUBMITTALS

A. Under the provisions of Section 27 05 00 and Division 1, prior to the start of work, the Contractor shall submit:

1. Complete information on testing procedure as described herein.
2. Test plan summary for each cable type to be tested including equipment to be used, setup, test frequencies or wavelengths, results format, etc.

PART 2 - PRODUCTS

2.1 TESTING COPPER

A. General Requirements:

1. Perform acceptance tests as indicated below for each sub-system (e.g., backbone, horizontal, etc.) as it is completed.
2. Supply all equipment and personnel necessary to conduct the acceptance tests. The method of testing shall be approved by the Architect/Engineer.
3. Visually inspect all cabling and termination points to ensure that they are complete and conform to the wiring pattern defined herein. Provide the Architect/Engineer with a written certification that this inspection has been made.
4. Conduct acceptance testing according to a schedule coordinated with the Owner/Architect/Engineer. Representatives of the Owner may be in attendance to witness the test procedures. Provide a minimum of one (1) week's advance notice to the Architect/Engineer to allow for such participation. The notification shall include a written description of the proposed conduct of the tests, including copies of blank test result sheets to be used.
5. Tests related to connected equipment of others shall only be done with the permission and presence of the Contractor involved. The Contractor shall ascertain that testing only is required to prove the wiring connections are correct.

6. Provide test results and describe the conduct of the tests including the date of the tests, the equipment used, and the procedures followed. At the request of the Architect/Engineer, provide copies of the original test results in their native format.
7. All cabling shall be 100% fault-free unless noted otherwise. If any cable is found to be outside the specification defined herein, that cable and the associated termination(s) shall be replaced at the expense of the Contractor. The applicable tests shall then be repeated.
8. Should it be found by the Architect/Engineer that the materials or any portion thereof furnished and installed under this Contract fail to comply with the specifications and drawings with respect or regard to the quality, amount, or value of materials, appliances, or labor used in the work, it shall be rejected and replaced by the Contractor and all work disturbed by changes necessitated in consequence of said defects or imperfections shall be made good at the Contractor's expense.

    a. CAT 6 Cable:

        1) Testing shall be from the modular jack at the information outlet to the modular patch panel in the communication equipment room.
        2) Horizontal cable shall be free of shorts within the pairs, and be verified for continuity, pair validity and polarity, and conductor position on the modular jack (e.g., wire map). Any defective, split, or mis-positioned pairs must be identified and corrected.
        3) CAT 6 horizontal cable shall be tested to 250 MHz as defined by TIA/EIA-568-C.2. Measurements shall be of the "Permanent Link", including cabling and modular jacks at the information outlet and modular patch panel. Parameters to be tested must include:

            a) Wire Map
            b) Length
            c) NEXT Loss (Pair-to-Pair)
            d) NEXT (Power Sum)
            e) ELFEXT (Pair-to-Pair)
            f) ELFEXT (Power Sum)
            g) Return Loss
            h) Attenuation
            i) Propagation Delay
            j) Delay Skew

        4) The maximum length of horizontal cable shall not exceed 295 feet, which allows 33 feet for technology equipment and modular patch cords.

5) To establish testing baselines, cable samples of known length and of the cable type and lot installed shall be tested. The cable may be terminated with an eight-position CAT 6 modular connector (8-pin) to facilitate testing. Nominal Velocity of Propagation (NVP) and nominal attenuation values shall be calculated based on this test and be utilized during the testing of the installed cable plant. This requirement can be waived if NVP and nominal attenuation data is available from the cable manufacturer for the exact cable type under test.
6) CAT 6 horizontal cable testing shall be performed using a test instrument designed for testing to 250 MHz or higher. Test records shall verify, "PASS" on each cable and display the specified parameters, comparing test values with standards based "templates" integral to the unit. Test records that report a PASS*, FAIL*, or FAIL result for any of the parameters will not be accepted.
7) In the event results of the tests are not satisfactory, the Contractor shall make adjustments, replacements, and changes as necessary and shall then repeat the test or tests that disclosed faulty or defective material, equipment, or installation methods, and shall make additional tests as the Architect/Engineer deems necessary at no additional expense to the project or user agency.

2.2 TESTING FIBER

A. General Requirements:

1. Perform acceptance tests as indicated below for each optical fiber sub-system (e.g., backbone, horizontal, etc.) as it is completed.
2. Supply all equipment and personnel necessary to conduct the acceptance tests. The method of testing shall be approved by the Architect/Engineer.
3. Visually inspect all optical fiber cabling and termination points to ensure that they are complete and conform to the standards defined herein. Provide the Architect/Engineer with a written certification that this inspection has been made.
4. Conduct acceptance testing according to a schedule coordinated with the Owner/Architect/Engineer. Representatives of the Owner may be in attendance to witness the test procedures. Provide a minimum of one (1) week's advance notice to the Architect/Engineer to allow for such participation. The notification shall include a written description of the proposed conduct of the tests, including copies of blank test result sheets to be used.
5. Tests related to connected equipment of others shall only be done with the permission and presence of the Contractor involved. The Contractor shall ascertain that testing only is required to prove that the optical fiber connections are correct.
6. Provide test results and describe the conduct of the tests including the date of the tests, the equipment used and the procedures followed. At the request of the Architect/Engineer, provide copies of the original test results.
7. All optical fiber cabling shall be 100% fault-free unless noted otherwise. If any optical fiber cable is found to be outside the specification defined herein, that optical fiber cable and the associated connector(s) shall be replaced at the expense of the Contractor. The applicable tests shall then be repeated.

8. Should it be found by the Architect/Engineer that the materials or any portion thereof furnished and installed under this Contract fail to comply with the specifications and drawings with respect or regard to the quality, amount, or value of materials, appliances, or labor used in the work, it shall be rejected and replaced by the Contractor and all work disturbed by changes necessitated in consequence of said defects or imperfections shall be made good at the Contractor's expense.
9. The optical fibers utilized in the installed cable shall be traceable to the manufacturer. Upon request by the Owner, provide cable manufacturer's test report for each reel of cable provided. These test reports shall include manufacturer's on-reel attenuation test results at 850-nm and 1300-nm for each optical fiber of each reel prior to shipment from the manufacturer.

    a. On-the-reel bandwidth performance as tested at the factory. Factory data shall be provided upon request.
    b. The testing noted for optical fiber cabling utilizes an Optical Time Domain Reflectometer (OTDR). However, the Contractor may submit to the Architect/Engineer for pre-approval of alternate fiber optic testing equipment.

B. Tests Prior to Installation: The Contractor, at their discretion and at no cost to the Owner, may perform an attenuation test with an OTDR at 850-nm or 1300-nm on each optical fiber of each cable reel prior to installation. Supply this test data to the Architect/Engineer prior to installation.

C. Tests After Installation: Upon completion of cable installation and termination, the optical fiber cabling shall be tested to include:

1. Optical Attenuation ("Insertion Loss" Method):

    a. Optical Attenuation shall be measured on all terminated optical fibers in one direction of transmission using the "Insertion Loss" method measurement in accordance with the TIA/EIA 526-14, Method B, and be inclusive of the optical connectors and couplings installed at the system endpoints. Access jumpers shall be used at both the transmit and receive ends to ensure that an accurate measurement of connector losses is made. Multimode optical fibers shall be tested at 850 ± 30 nm. Singlemode optical fibers (if applicable) shall be tested at 1300 ± 20 nm.
    b. Attenuation of optical fibers shall not exceed the values calculated as follows:

        1) Attenuation (max.) = 2*C+L*F+S dB.
        2) Where C is the maximum allowable Connector Loss (in dB), L is the length of the run (in kilometers), and F is the maximum allowable optical fiber loss (in dB/km). S is the total splice loss (# of splices * maximum attenuation per splice).

2. Verification of Link Integrity (OTDR):

    a. All optical fibers shall be documented in one direction of transmission using an Optical Time Domain Reflectometer (OTDR). Multimode optical fibers shall be tested at 850-nm and 1300-nm (nominal). Singlemode optical fibers (if applicable) shall be tested at 1310-nm and 1550-nm (nominal). The OTDR(s) shall incorporate high-resolution optics optimized for viewing of short cable sections. Access jumpers of adequate length to allow viewing of the entire length of the cable, including the connectors at the launch and receive end, shall be used. Access jumpers used for testing shall match the type and core diameter of the fiber optic strand under test.
    b. Set OTDR's test variables to the manufacturer's published backscatter coefficient and velocity of propagation figure for the specific strand of fiber under test. OTDR's range should be set to approximately 1.5 times the length of the strand under test, pulse width should be optimized for the length of the fiber optic strand under test, and number of averages should be adjusted to approximately 120 seconds per wavelength.
    c. OTDR traces revealing a point discontinuity greater than 0.2 dB in a multimode optical fiber or 0.1 dB in a singlemode optical fiber (if applicable) at any of the tested wavelengths or any discontinuity showing a reflection at that point shall be a valid basis for rejection of that optical fiber by the Owner. The installation of that optical fiber cable shall be reviewed in an effort to remove any external stress that may be causing the fault. If such efforts do not remove the fault, that optical fiber cable and the associated terminations shall be replaced at the expense of the Contractor.

2.3 DOCUMENTATION/AS-BUILTS/RECORDS

A. General:

1. Upon completion of the installation, submit as-builts per the requirements of Section 27 05 00 and Division 1. Documentation shall include the items detailed in the subsections below.
2. All documentation, including hard copy and electronic forms, shall become the property of the Owner.
3. The Architect/Engineer may request that a 10% random field retest be conducted on the cable system at no additional cost to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the Contractor, additional testing can be requested to the extent determined necessary by the Architect/Engineer, including a 100% retest. This retest shall be at no additional cost to the Owner.

B. Copper Media Test Data:

1. Test results shall include a record of test frequencies, cable type, conductor pair and cable (or Outlet) I.D., measurement direction, test equipment type, model and serial number, date, reference setup, and crew member name(s).

2. Printouts generated for each cable by the wire test instrument shall be submitted as part of the documentation package. The Contractor shall furnish this information in electronic form (USB thumb drive). The thumb drive shall contain the electronic equivalent of the test results as defined by the bid specification and be in the tester's native format as well as summaries of each test in pdf format. Provide a licensed copy of the software required to view and print the data that is provided in a proprietary format. Furnish one (1) copy of the data and display (if applicable) software.

C. Optical Fiber Media Test Data:

1. Test results shall include a record of test wavelengths, cable type, fiber and cable (or Outlet) I.D., measurement direction, test equipment type, model and serial number, date, reference setup, and crew member name(s).
2. OTDR traces of individual optical fiber "signatures" obtained as specified above shall be provided to the Architect/Engineer in electronic form for review. Trace files shall be so named as to identify each individual optical fiber by location in the cable system and optical fiber number or color. Where traces are provided in electronic form, provide along with the above documentation, one (1) licensed copy of software that will allow for the display of OTDR traces provided. The software shall run on a Microsoft Windows-based personal computer.

D. Record Drawings:

1. The drawings are to include cable routes and outlet locations. Outlet locations shall be identified by their sequential number as defined elsewhere in this document. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided.

PART 3 - EXECUTION (Not Used)

END OF SECTION 27 17 10

SECTION 28 05 00 - BASIC ELECTRONIC SAFETY AND SECURITY SYSTEM REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Basic Safety and Security System Requirements (herein referred to Security) specifically applicable to Division 28 sections, in addition to Division 1 - General Requirements.

B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

1.2 SCOPE OF WORK

A. This Specification and the accompanying drawings govern the work involved in furnishing, installing, testing and placing into satisfactory operation the security systems as shown on the drawings and specified herein.

B. Each Contractor shall provide all new materials as indicated in the schedules on the drawings, and/or in these specifications, and all items required to make the portion of the security systems a finished and working system.

C. Separate contracts will be awarded for the following work.

D. All work will be awarded under a single General Contract. The division of work listed below is for the Contractor's convenience and lists normal breakdown of the work.

E. Separate contracts will be awarded for the following work. The division of work listed below is for the contractors' convenience and lists a normal breakdown of the work. Please refer to the Construction Manager's scope statements for complete scope of work description.

F. Description of systems include but are not limited to the following:

1. Electronic access control system
2. Video surveillance
3. Fire detection and alarm.
4. Low voltage security wiring (less than +120VAC) as specified and required for proper system control and communications.
5. All associated electrical backboxes, conduit, miscellaneous cabling, and power supplies required for proper system installation and operation as defined in the "Suggested Matrix of Scope Responsibility".
6. Firestopping of penetrations of fire-rated construction as described in Division 7.

1.3 WORK SEQUENCE

A. All construction work that will produce excessive noise levels and interference with normal building operations, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during non-occupied hours. The Owner shall reserve the right to set policy as to when restricted construction hours will be required.

B. Itemize all work and list associated hours and pay scale for each item.

1.4 ALTERNATES

A. The public service radio system distributed Antenna System (DAS) shall eb bid as an alternate. The need for a DAS shall be determined after on-site radio checks have been made within the substantially completed structures.

1.5 DIVISION OF WORK BETWEEN ELECTRICAL AND SECURITY CONTRACTORS

A. Division of work is the responsibility of the Prime Contractor. Any scope of work described in the contract document shall be sufficient for including said requirement in the project. The Prime Contractor shall be solely responsible for determining the appropriate subcontractor for the described scope. In no case shall the project be assessed an additional cost for scope that is described in the contract documents. The following division of responsibility is a guideline based on typical industry practice.

B. Definitions:

1. "Electrical Contractor" as referred to herein refers to the Contractors listed in Division 26 of this Specification.
2. "Electrical Contractor" shall also refer to the Contractor listed in Division 28 of this specification when the "Suggested Matrix of Scope Responsibility" indicates the work shall be provided by the EC. Refer to the Contract Documents for the "Suggested Matrix of Scope Responsibility".
3. "Security Contractor" as referred to herein refers to the Contractors listed in Division 28 of this Specification.
4. Low Voltage Security Wiring: The wiring (less than 120VAC) associated with the Security Systems, used for analog and/or digital signals between equipment.

C. General:

1. The purpose of these Specifications is to outline typical Electrical and Security Contractor's work responsibilities as related to security systems including back boxes, conduit, power wiring and low voltage security wiring. The prime contractor is responsible for all divisions of work.
2. The exact wiring requirements for much of the equipment cannot be determined until the systems have been purchased and submittals are approved. Therefore, only known wiring, conduits, raceways, and electrical power as related to such items, is shown on the Security Drawings. Other wiring, conduits, raceways, junction boxes, and electrical power not shown on the Security Drawings but required for the successful operation of the systems shall be the responsibility of the Security Contractor and included in the Contractor's bid.

3. Where the Electrical Contractor is required to install conduit, conduit sleeves and/or power connections in support of Security systems, the final installation shall not begin until a coordination meeting between the Electrical Contractor and the Security Contractor has convened to determine the exact location and requirements of the installation.
4. Where the Electrical Contractor is required to install cable tray that will contain Low Voltage Security Wiring, the installation shall not begin until the Security Contractor has completed a coordination review of the cable tray shop drawing.
5. This Contractor shall establish Electrical and Security utility elevations prior to fabrication and installation. The Security Contractor shall cooperate with the Electrical Contractor and the determined elevations in accordance with the guidelines below. This Contractor shall coordinate utility elevations with other trades. When a conflict arises, priority shall be as follows:

    a. Lighting Fixtures
    b. Gravity Flow Piping, including Steam and Condensate
    c. Sheet Metal
    d. Sprinkler Piping and other Piping
    e. Conduit and Wireway
    f. Open Cabling

D. Electrical Contractor's Responsibility:

1. Assumes all responsibility for all required conduit and power connections when shown on the "Suggested Matrix of Scope Responsibility" to be provided by the Electrical Contractor.
2. Assumes all responsibility for providing and installing cable tray.
3. Responsible for Security Systems grounding and bonding.
4. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

E. Security Contractor's Responsibility:

1. Assumes all responsibility for the low voltage security wiring of all systems, including cable support where open cable is specified.
2. Assumes all responsibility for all required backboxes, conduit and power connections not specifically shown as being provided by the Electrical Contractor on the "Suggested Matrix of Scope Responsibility."
3. Assumes all responsibility for providing and installing all ladder rack and other cable management hardware (as defined herein).
4. Responsible for providing the Electrical Contractor with the required grounding lugs or other hardware for each piece of security equipment which is required to be bonded to the telecommunications bonding system.
5. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other contractors to determine a viable layout.

1.6 COORDINATION DRAWINGS

A. Definitions:

1. Coordination Drawings: A compilation of the pertinent layout and system drawings that show the sizes and locations, including elevations, of system components and required access areas to ensure that no two objects will occupy the same space.

    a. Mechanical trades shall include, but are not limited to, mechanical equipment, ductwork, fire protection systems, plumbing piping, medical gas systems, hydronic piping, steam and steam condensate piping, and any item that may impact coordination with other disciplines.
    b. Electrical trades shall include, but are not limited to, electrical equipment, conduit 1.5" and larger, conduit racks, cable trays, pull boxes, transformers, raceway, busway, lighting, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
    c. Technology trades shall include, but are not limited to, technology equipment, racks, conduit 1.5" and larger, conduit racks, cable trays, ladder rack, pull boxes, raceway, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
    d. Maintenance clearances and code-required dedicated space shall be included.
    e. The coordination drawings shall include all underground, underfloor, in-floor, in chase, and vertical trade items.

2. Spaces with open/cloud ceiling architecture shall indicate the overhead utilities and locate equipment as required to maintain clearance above lights. The intent for the installation is to maintain a maximum allowable vertical clearance and an organized/clean manner in the horizontal. Notify Architect/Engineer of the maximum clearance which can be maintained. Failure to comply will result in modifications with no cost to Owner.

    a. In cloud ceiling architecture, when open cabling/wire and/or cable tray crosses gaps between ceiling clouds and/or walls, cabling is to transition to conduits to span the gaps in order to conceal cabling from below.

3. The contractors shall use the coordination process to identify the proper sequence of installation of all utilities above ceilings and in other congested areas, to ensure an orderly and coordinated end result, and to provide adequate access for service and maintenance.

B. Participation:

1. The contractors and subcontractors responsible for work defined above shall participate in the coordination drawing process.
2. One contractor shall be designated as the Coordinating Contractor for purposes of preparing a complete set of composite electronic CAD coordination drawings that include all applicable trades, and for coordinating the activities related to this process. The Coordinating Contractor for this project shall be the Mechanical Contractor.

a. The Coordinating Contractor shall utilize personnel familiar with requirements of this project and skilled as draftspersons/CAD operators, competent to prepare the required coordination drawings.

3. Electronic CAD drawings shall be submitted to the Coordinating Contractor for addition of work by other trades. IMEG will provide electronic file copies of applicable drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by IMEG. IMEG will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings.

C. Drawing Requirements:

1. The file format and file naming convention shall be coordinated with and agreed to by all contractors participating in the coordination process and the Owner.

a. Scale of drawings:

1) General plans: 1/4 Inch = 1'-0" (minimum).
2) Mechanical, electrical, communication rooms, and including the surrounding areas within 10 feet: 1/2 Inch = 1'-0" (minimum).
3) Shafts and risers: 1/2 Inch = 1'-0" (minimum).
4) Sections of shafts and mechanical and electrical equipment rooms: 1/4 Inch = 1'-0" (minimum).
5) Sections of congested areas: 1/2 Inch = 1'-0" (minimum).

2. Ductwork layout drawings shall be the baseline system for other components. Ductwork layout drawings shall be modified to accommodate other components as the coordination process progresses.
3. There may be more drawings required for risers, top and bottom levels of mechanical rooms, and shafts.
4. The minimum quantity of drawings will be established at the first coordination meeting and sent to the A/E for review. Additional drawings may be required if other areas of congestion are discovered during the coordination process.

D. General:

1. Coordination drawing files shall be made available to the A/E and Owner's Representative. The A/E will only review identified conflicts and give an opinion, but will not perform as a coordinator.
2. A plotted set of coordination drawings shall be available at the project site.
3. Coordination drawings are not shop drawings and shall not be submitted as such.
4. The contract drawings are schematic in nature and do not show every fitting and appurtenance for each utility. Each contractor is expected to have included in the bid sufficient fittings, material, and labor to allow for adjustments in routing of utilities made necessary by the coordination process and to provide a complete and functional system.
5. The contractors will not be allowed additional costs or time extensions due to participation in the coordination process.

6. The contractors will not be allowed additional costs or time extensions for additional fittings, reroutings or changes of duct size, that are essentially equivalent sizes to those shown on the drawings and determined necessary through the coordination process.
7. The A/E reserves the right to determine space priority of equipment in the event of spatial conflicts or interference between equipment, piping, conduit, ducts, and equipment provided by the trades.
8. Changes to the contract documents that are necessary for systems installation and coordination shall be brought to the attention of the A/E.
9. Access panels shall preferably occur only in gypsum board walls or plaster ceilings where indicated on the drawings.

    a. Access to mechanical, electrical, technology, and other items located above the ceiling shall be through accessible lay-in ceiling tile areas.
    b. Potential layout changes shall be made to avoid additional access panels.
    c. Additional access panels shall not be allowed without written approval from the A/E at the coordination drawing stage.
    d. Providing additional access panels shall be considered after other alternatives are reviewed and discarded by the A/E and the Owner's Representative.
    e. When additional access panels are required, they shall be provided without additional cost to the Owner.

10. Complete the coordination drawing process and obtain signoff of the drawings by all contractors prior to installing any of the components.
11. Conflicts that result after the coordination drawings are signed off shall be the responsibility of the contractor or subcontractor who did not properly identify their work requirements, or installed their work without proper coordination.
12. Updated coordination drawings that reflect as-built conditions may be used as record documents.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Only products of reputable manufacturers as determined by the Architect/Engineer will be acceptable.
2. Each Contractor and their subcontractors shall employ only workers who are skilled in their respective trades and fully trained. All workers involved in the installation, termination, testing, and placing into operation electronic security devices shall be individually trained by the manufacturer.
3. The Contractor shall be experienced in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size.
4. The Contractor shall own and maintain tools and equipment necessary for successful installation and testing of electronic security devices and have personnel adequately trained in the use of such tools and equipment.
5. A resume of qualification shall be submitted with the Contractor's bid indicating the following:

a. A list of recently completed projects of similar type and size with contact names and telephone numbers for each.

B. Compliance with Codes, Laws, Ordinances:

1. Conform to all requirements of the City of Caseyville, Illinois Codes, Laws, Ordinances and other regulations having jurisdiction.
2. In the event there are no local codes having jurisdiction over this job, the current issue of the National Electrical Code shall be followed.
3. If there is a discrepancy between the codes and regulations having jurisdiction over this installation, and these specifications, Architect/Engineer shall determine the method or equipment used.
4. If the Contractor notes, at the time of bidding, that any parts of the drawings or specifications do not comply with the codes or regulations, Contractor shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time to follow this procedure, Contractor shall submit with the proposal a separate price to make the system comply with the codes and regulations.
5. Verify the installation environment prior to purchasing or installing any cable. Cable installed in a plenum environment shall be appropriately rated. Bring all discrepancies between the contract documents and installation conditions to the attention of the Architect/Engineer prior to purchase or installation.
6. All changes to the system made after the letting of the contract, in order to comply with the applicable codes or the requirements of the Inspector, shall be made by the Contractor without cost to the Owner.

C. Permits, Fees, Taxes, Inspections:

1. Procure all applicable permits and licenses.
2. Abide by all applicable laws, regulations, ordinances, and other rules of the State or Political Subdivision wherein the work is done, or as required by any duly constituted public authority.
3. Pay all applicable charges for such permits or licenses that may be required.
4. Pay all applicable fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
5. Pay all charges arising out of required inspections due to codes, permits, licenses or as otherwise may be required by an authorized body.
6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized independent agency/consultant.
7. All equipment, and materials shall be as approved or listed by the following: (Unless approval or listing is not applicable to an item by all acceptable manufacturers.)

    a. Factory Mutual
    b. Underwriters' Laboratories, Inc.

D. Examination of Drawings:

1. The drawings for the Security Systems work are diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and the exact routing of cabling to best fit the layout of the job. Scaling of the drawings will not be sufficient or accurate for determining this layout. Where a specific route is required, such route will be indicated on the drawings.
3. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
4. If an item is either shown on the drawings, called for in the specifications or required for proper operation of the system, it shall be considered sufficient for including same in this contract.
5. The determination of quantities of material and equipment required shall be made by the Contractor from the drawings. Schedules on the drawings and in the specifications are completed as an aid to the Contractor but where discrepancies arise, the greater number shall govern.
6. Where words "provide", "install", or "furnish" are used on the drawings or in the specifications, it shall be taken to mean, to furnish, install and terminate completely ready for operation, the items mentioned.

E. Electronic Media/Files:

1. Construction drawings for this project have been prepared utilizing Revit.
2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by IMEG. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.
4. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
5. The drawings prepared by IMEG for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.
6. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.
7. The information is provided to expedite the project and assist the Contractor with no guarantee by IMEG as to the accuracy or correctness of the information provided. IMEG accepts no responsibility or liability for the Contractor's use of these documents.

F. Field Measurements:

1. Before ordering any materials, this Contractor shall verify all pertinent dimensions at the job site and be responsible for their accuracy.

1.8 SUBMITTALS

A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

1. Submittals list:

Referenced Specification Section	Submittal Item	Coordination Drawings
28 05 03	Through-Penetration Firestopping	
28 13 00	Electronic Access Control	
28 23 00	Video Surveillance	Yes
28 05 37	Distrubuted Antenna System (DAS) for Public Safety	Yes

B. General Submittal Procedures: In addition to the provisions of Division 1, the following are required:

1. Transmittal: Each transmittal shall include the following:

a. Date
b. Project title and number
c. Contractor's name and address
d. Division of work (e.g., plumbing, heating, ventilating, etc.)
e. Description of items submitted and relevant specification number
f. Notations of deviations from the contract documents
g. Other pertinent data

2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:

a. Date
b. Project title and number
c. Architect/Engineer
d. Contractor and subcontractors' names and addresses
e. Supplier and manufacturer's names and addresses
f. Division of work (e.g., plumbing, heating, ventilating, etc.)
g. Description of item submitted (using project nomenclature) and relevant specification number
h. Notations of deviations from the contract documents
i. Other pertinent data
j. Provide space for Contractor's review stamps

3. Composition:

a. Submittals shall be submitted using specification sections and the project nomenclature for each item.

b. Individual submittal packages shall be prepared for items in each specification section. All items within a single specification section shall be packaged together where possible. An individual submittal may contain items from multiple specifications sections if the items are intimately linked (e.g., pumps and motors).
c. All sets shall contain an index of the items enclosed with a general topic description on the cover.

4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; wiring and control diagrams; dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
5. Contractor's Approval Stamp:

a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
b. Unstamped submittals will be rejected.
c. The Contractor's review shall include, but not be limited to, verification of the following:

1) Only approved manufacturers are used.
2) Addenda items have been incorporated.
3) Catalog numbers and options match those specified.
4) Performance data matches that specified.
5) Electrical characteristics and loads match those specified.
6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
7) Dimensions and service clearances are suitable for the intended location.
8) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
9) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).

d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.
e. The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.

6. Submittal Identification and Markings:

    a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
    b. The Contractor shall clearly indicate the size, finish, material, etc.
    c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
    d. All marks and identifications on the submittals shall be unambiguous.

7. Schedule submittals to expedite the project. Coordinate submission of related items.
8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.
9. Reproduction of contract documents alone is not acceptable for submittals.
10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Architect/Engineer.
11. Submittals not required by the contract documents may be returned without review.
12. The Architect/Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Architect/Engineer to recheck and handle the additional shop drawing submittals.
13. Submittals shall be reviewed and approved by the Architect/Engineer before releasing any equipment for manufacture or shipment.
14. Contractor's responsibility for errors, omissions or deviation from the contract documents in submittals is not relieved by the Architect/Engineer's approval.
15. Schedule shall allow for adequate time to perform orderly and proper review of submittals, including time for consultants and Owner if required, and resubmittals by Contractor if necessary, and to cause no delay in Work or in activities of Owner or other contractors.

    a. Allow at least two weeks for Architect's/Engineer's review and processing of each submittal.

16. Architect/Engineer reserves the right to withhold action on a submittal which, in the Architect/Engineer's opinion, requires coordination with other submittals until related submittals are received. The Architect/Engineer will notify the Contractor, in writing, when they exercise this right.

C. Electronic Submittal Procedures:

1. Distribution: Email submittals as attachments to all parties designated by the Architect/Engineer, unless a web-based submittal program is used.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.

4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. Submittal file name: 28 XX XX.description.YYYYMMDD
    b. Transmittal file name: 28 XX XX.description.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.

1.9 SCHEDULE OF VALUES

A. The requirements herein are in addition to the provisions of Division 1.

B. Format:

1. Use AIA Document Continuation Sheets G703 or another similar form approved by the Owner and Architect/Engineer.
2. Submit in Excel format.
3. Support values given with substantiating data.

C. Preparation:

1. Itemize work required by each specification section and list all providers. All work provided by subcontractors and major suppliers shall be listed on the Schedule of Values. List each subcontractor and supplier by company name.
2. Break down all costs into:

    a. Material: Delivered cost of product with taxes paid.
    b. Labor: Labor cost, excluding overhead and profit.

3. Itemize the cost for each of the following:

    a. Overhead and profit.
    b. Bonds.
    c. Insurance.
    d. General Requirements: Itemize all requirements.

4. For each line item having an installed cost of more than $5,000, break down costs to list major products or operations under each item. At a minimum, provide material and labor cost line items for the following:

    a. Security systems:

        1) Surveillance
        2) Access control
        3) Intrusion
        4) Infant abduction

D. Update Schedule of Values when:

1. Indicated by Architect/Engineer.
2. Change of subcontractor or supplier occurs.
3. Change of product or equipment occurs.

1.10 CHANGE ORDERS

A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders shall be broken down by sheet or associated individual line item indicated in the change associated narrative, whichever provides the most detailed breakdown. Change orders with inadequate breakdown will be rejected.

B. Itemized pricing with unit cost shall be provided from all distributors and associated subcontractors.

C. Change order work shall not proceed until authorized.

1.11 EQUIPMENT SUPPLIERS' INSPECTION

A. The following equipment shall not be placed in operation until a representative of the manufacturer has inspected the installation and certified that the equipment is properly installed and that the equipment is ready for operation:

1. Firestopping, including mechanical firestop systems.

1.12 PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE

A. Exercise care in transporting and handling to prevent damage to fixtures, equipment and materials.

B. Store materials on the site to prevent damage.

C. Keep fixtures, equipment and materials clean, dry and free from harmful conditions.

1.13 NETWORK / INTERNET CONNECTED EQUIPMENT

A. These specifications may require certain equipment or systems to have network, Internet and/or remote access capability ("Network Capability"). Any requirement for Network Capability shall be interpreted only as a functional capability and is not to be construed as authority to connect or enable any Network Capability. Network Capability may only be connected or enabled with the express written consent of the Owner.

1.14 WARRANTY

A. At a minimum, provide a one (1) year warranty for all equipment, materials, and workmanship. Individual specifications sections within Division 28 may require additional warranty requirements for specific equipment or systems.

B. The warranty period for the entire installation described in this Division of the specifications shall commence on the date of substantial completion unless a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner or their representative.

C. Warranty requirements shall extend to correction, without cost to the final user, of all work and/or equipment found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage resulting from such defects or nonconformance with contract documents exclusive of repairs required as a result of improper maintenance or operation, or of normal wear as determined by the Architect/Engineer.

1.15 INSURANCE

A. Contractor shall maintain insurance coverage as set forth in Division 0 of these specifications.

1.16 MATERIAL SUBSTITUTION

A. Where several manufacturers' names are given, the first named manufacturer constitutes the basis for job design and establishes the equipment quality required.

B. Equivalent equipment manufactured by the other named manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meets all requirements of the drawings and specifications and fits in the allocated space. When using other listed manufacturers, the Contractor shall assume responsibility for any and all modifications necessary (including, but not limited to structural supports, electrical connections and rough-in, and regulatory agency approval, etc.) and coordinate such with other contractors. The Architect/Engineer shall make the final determination of whether a product is equivalent.

C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer via addendum. The Contractor bears full responsibility for the unnamed manufacturers' equipment adequately meeting the intent of design. The Architect/Engineer may reject manufacturer at time of shop drawing submittal. The Contractor assumes all costs incurred by other trades on the project as a result of changes necessary to accommodate the offered material, equipment or installation method.

D. Should this Contractor be unable to secure approval from the Architect/Engineer for other unnamed manufacturers as outlined above, this Contractor may list voluntary add or deduct prices for alternate materials on the bid form. These items will not be used in determining the low bidder. Should a voluntary alternate material be accepted, This Contractor shall assume all costs that may be incurred as a result of using the offered material, article or equipment necessitating extra expense on This Contractor or on the part of other Contractors whose work is affected.

PART 2 - PRODUCTS

2.1 Refer to individual sections.

PART 3 - EXECUTION

3.1 JOBSITE SAFETY

A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or the employees and subconsultants at a construction site, shall relieve the Contractor and any other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Installation of all conduit and cabling shall comply with Sections 26 05 33 and 26 05 13. Additional conduit requirements described within this Division shall be supplemental to the requirement described in Section 26 05 33. Should conflicts exist between the two Divisions the more stringent (more expensive material and labor) condition shall prevail until bidding addendum or construction clarification or RFI can be submitted and responded to. In no case shall the Contractor carry the least stringent condition in the pricing.

B. It is the Contractor's responsibility to survey the site and include all necessary costs to perform the installation as specified.

C. The Contractor shall be responsible for identifying and reporting to the Architect/Engineer any existing conditions including but not limited to damage to walls, flooring, ceiling and furnishings prior to start of work. All damage to interior spaces caused by this Contractor shall be repaired at this Contractor's expense to pre-existing conditions, including final colors and finishes.

D. All cables and devices installed in damp or wet locations, including any underground or underslab location, shall be listed as suitable for use in such environments. Follow manufacturer's recommended installation practices for installing cables and devices in damp or wet locations. Any cable or device that fails as a result of being installed in a damp or wet location shall be replaced at the Contractor's expense.

3.3 FIELD QUALITY CONTROL

A. General:

1. Refer to specific Division 28 sections for further requirements.
2. The Contractor shall conduct all tests required and applicable to the work both during and after construction of the work.
3. The necessary instruments and materials required to conduct or make the tests shall be supplied by the Contractor who shall also supply competent personnel for making the tests who has been schooled in the proper testing techniques.
4. In the event the results obtained in the tests are not satisfactory, This Contractor shall make such adjustments, replacements and changes as are necessary and shall then repeat the test or tests which disclose faulty or defective work or equipment and shall make such additional tests as the Architect/Engineer or code enforcing agency deems necessary.

B. Protection of cable from foreign materials:

1. It is the Contractor's responsibility to provide adequate physical protection to prevent foreign material application or contact with any cable type. Foreign material is defined as any material that would negatively impact the validity of the manufacturer's performance warranty. This includes, but is not limited, to overspray of paint (accidental or otherwise), drywall compound, or any other surface chemical, liquid or compound that could come in contact with the cable, cable jacket or cable termination components.
2. Application of foreign materials of any kind on any cable, cable jacket or cable termination component will not be accepted. It shall be the Contractor's responsibility to replace any component containing overspray, in its entirety, at no additional cost to the project. Cleaning of the cables with harsh chemicals is not allowed. This requirement is regardless of the PASS/FAIL test results of the cable containing overspray. Should the manufacturer and warrantor of the structured cabling system desire to physically inspect the installed condition and certify the validity of the structured cabling system (via a signed and dated statement by an authorized representative of the structured cabling manufacturer), the Owner may, at their sole discretion, agree to accept said warranty in lieu of having the affected cables replaced. In the case of plenum cabling, in addition to the statement from the manufacturer, the Contractor shall also present to the Owner a letter from the local Authority Having Jurisdiction stating that they consider the plenum rating of the cable to be intact and acceptable.

3.4 PROJECT CLOSEOUT

A. Refer to the Division 1 Section: PROJECT CLOSEOUT for requirements. The following paragraphs supplement the requirements of Division 1.

B. Final Jobsite Observation:

1. The Architect/Engineer will not perform a final jobsite observation until the project is ready. This is not dictated by schedule, but rather by completeness of the project.

2. Refer to the end of Section 27 05 00 for a "STATEMENT INDICATING READINESS FOR FINAL JOBSITE OBSERVATION."
3. The Contractor shall sign this form and return it to the Architect/Engineer so that the final observation can commence.

C. Before final payment will be authorized, this Contractor must have completed the following:

1. Submitted operation and maintenance manuals to the Architect/Engineer for review.
2. Submitted bound copies of approved shop drawings.
3. Record documents including edited drawings and specifications accurately reflecting field conditions, **inclusive** of all project revisions, change orders, and modifications.
4. Submitted a report stating the instructions given to the Owner's representative complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of This Contractor and shall be signed by the Owner's representative as having received the instructions.
5. Submitted testing reports for all systems requiring final testing as described herein.
6. Submitted start-up reports on all equipment requiring a factory installation inspection and/or start.
7. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site; submit receipt to Architect/Engineer prior to final payment being approved.

3.5 OPERATION AND MAINTENANCE MANUALS

A. General:

1. Provide an electronic copy of the O&M manuals as described below for Architect/Engineer's review and approval. The electronic copy shall be corrected as required to address the Architect/Engineer's comments. Once corrected, electronic copies and paper copies shall be distributed as directed by the Architect/Engineer.
2. Approved O&M manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.

B. Electronic Submittal Procedures:

1. Distribution: Email the O&M manual as attachments to all parties designated by the Architect/Engineer.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.

4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.

    a. O&M file name: O&M.div28.contractor.YYYYMMDD
    b. Transmittal file name: O&Mtransmittal.div28.contractor.YYYYMMDD

5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.
6. Provide the Owner with an approved copy of the O&M manual on compact discs (CD), digital video discs (DVD), or flash drives with a permanently affixed label, printed with the title "Operation and Maintenance Instructions", title of the project and subject matter of disc/flash drive when multiple disc/flash drives are required.
7. All text shall be searchable.
8. Bookmarks shall be used, dividing information first by specification section, then systems, major equipment and finally individual items. All bookmark titles shall include the nomenclature used in the construction documents and shall be an active link to the first page of the section being referenced.

C. Operation and Maintenance Instructions shall include:

1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all subcontractors, and major equipment suppliers, with addresses, telephone numbers, website addresses, email addresses and point of contacts. Website URLs and email addresses shall be active links in the electronic submittal.
2. Table of Contents: Include a table of contents describing specification section, systems, major equipment, and individual items.
3. Copies of all final approved shop drawings and submittals. Include Architect's/Engineer's shop drawing review comments. Insert the individual shop drawing directly after the Operation and Maintenance information for the item(s) in the review form.
4. Copy of final approved test and balance reports.
5. Copies of all factory inspections and/or equipment startup reports.
6. Copies of warranties.
7. Schematic wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
8. Dimensional drawings of equipment.
9. Capacities and utility consumption of equipment.
10. Detailed parts lists with lists of suppliers.
11. Operating procedures for each system.
12. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
13. Repair procedures for major components.
14. List of lubricants in all equipment and recommended frequency of lubrication.
15. Instruction books, cards, and manuals furnished with the equipment.

3.6 INSTRUCTING THE OWNER'S REPRESENTATIVE

A. Adequately instruct the Owner's designated representative or representatives in the maintenance, care, and operation of the complete systems installed under this contract.

B. Provide verbal and written instructions to the Owner's representative or representatives by FACTORY PERSONNEL in the care, maintenance, and operation of the equipment and systems.

C. Contractor shall make a DVD video recording of instructions to the Owner while explaining the system so additional personnel may view the instructions at a later date. The video recording shall be the property of the Owner.

D. The Owner has the option to make a video recording of all instructions. Coordinate schedule of instructions to facilitate this recording.

E. Notify the Architect/Engineer of the time and place for the verbal instructions to be given to the Owner's representative so a representative can be present if desired.

F. Refer to the individual specification sections for minimum hours of instruction time for each system.

G. Operating Instructions:

1. The Contractor is responsible for all instructions to the Owner and/or Owner's operating staff on the security systems.
2. If the Contractor does not have Engineers and/or Technicians on staff that can adequately provide the required instructions on system operation, performance, troubleshooting, care and maintenance, the Contractor shall include in the bid an adequate amount to reimburse the Owner for the Architect/Engineer to perform these services.

3.7 SYSTEM STARTING AND ADJUSTING

A. The security systems included in the construction documents are to be complete and operating systems. The Architect/Engineer will make periodic job site observations during the construction period. The system start-up, testing, configuration, and satisfactory system performance is the responsibility of the Contractor. This shall include all calibration and adjustments of electrical equipment controls, equipment settings, software configuration, troubleshooting and verification of software, and final adjustments that may be required.

B. All operating conditions and control sequences shall be simulated and tested during the start-up period.

C. The Contractor, subcontractors, and equipment suppliers are expected to have skilled technicians to ensure that the system performs as designed. If the Architect/Engineer is requested to visit the job site for the purpose of trouble shooting, assisting in the satisfactory start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period through no fault of the design; the Contractor shall reimburse the Owner on a time and material basis for services rendered at the Architect/Engineer's standard hourly rates in effect at the time the services are requested. The Contractor shall be responsible for making payment to the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

3.8 RECORD DOCUMENTS

A. Refer to the Division 1 Section: PROJECT CLOSEOUT for requirements. The following paragraphs supplement the requirements of Division 1.

B. Mark specifications to indicate approved substitutions, change orders, and actual equipment and materials used.

C. This Contractor shall maintain at the job site, a separate and complete set of Security Drawings which shall be clearly and permanently marked and noted in complete detail any changes made to the location and arrangement of equipment or made to the Technology Systems and wiring as a result of building construction conditions or as a result of instructions from the Architect or Engineer. All Change Orders, RFI responses, Clarifications and other supplemental instructions shall be marked on the documents. Record documents that merely reference the existence of the above items are not acceptable. Should This Contractor fail to complete Record Documents as required by this contract, This Contractor shall reimburse Architect/Engineer for all costs to develop record documents that comply with this requirement. Reimbursement shall be made at the Architect/Engineer's hourly rates in effect at the time of work.

D. Record actual routing of all conduits sized 2" or larger.

E. The above record of changes shall be made available for the Architect and Engineer's examination during any regular work time.

F. Upon completion of the job, and before final payment is made, This Contractor shall give the marked-up drawings to the Architect/Engineer.

3.9 ADJUST AND CLEAN

A. Contractor shall thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project.

B. Contractor shall clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material from equipment.

C. Contractor shall remove all rubbish, debris, etc., accumulated during the Contractor's operations from the premises.

END OF SECTION 28 05 00

SECTION 28 05 37 - DISTRIBUTED ANTENNA SYSTEM (DAS) FOR PUBLIC SAFETY NETWORKS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cabling and components.

1.2 RELATED WORK

A. Section 27 13 00 - Backbone Cabling Requirements

1.3 QUALITY ASSURANCE

A. Manufacturer: The DAS shall be a single-source manufacturer such that the single manufacturer distributes, supports, warranties, and services all major components. The manufacturer shall have a minimum of five (5) years documented experience with public safety networks (PSN).

B. Installer: The installing dealer must be a factory-authorized service and support company specializing in the selected manufacturer's product, with demonstrated prior experience with the selected manufacturer's system installation and programming.

C. Servicing Contractor: The manufacturer of the system must have local service representatives within 60 miles of the project site.

1.4 REFERENCES

A. EIA Electronics Institute of America Standards

B. IBC Chapter 5 Fire Service Features, Section 510 Emergency Responder Radio Coverage.

C. NFPA 70 - National Electrical Code

D. NFPA 72 - Chapter 24 Emergency Communications Systems (ECS)

E. NFPA 1221 - Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems

1.5 SUBMITTALS

A. Submit data under provisions of Section 28 05 00.

B. Product Data Submittal: Provide manufacturer's technical product specification sheet for the following:

1. Donor and coverage antennas

2. Cable and connectors
3. Splitters, combiners and couplers
4. Bi-directional amplifiers (BDA)
5. Fiber optic master and remote units
6. Power supplies

C. The Contractor shall submit a conceptual design for the Architect/Engineer to review. The conceptual design shall include the system topology, bandwidth usage, and materials list with all major devices and cut sheets as listed above.

D. The Contactor shall submit design drawings to the local Authority Having Jurisdiction (AHJ) for approval. The Contractor shall submit approved design drawings to the Architect/Engineer. Design drawings shall include:

1. Project specific system CAD drawings/floor plans of the proposed locations of antennas, equipment locations, vertical pathways, and all necessary grounding
2. RF link budget and propagation modeling plan
3. Materials list to include product description and model number

E. Identify all power requirements to include receptacle type, voltage and phase.

F. Submit proof of certification of the DAS system the Contractor is proposing.

G. Submit a letter of good standing with the proposed manufacturer.

H. Submit detailed description of Owner training to be conducted at project end, including suggested training duration.

1.6 DEFINITIONS

A. AHJ - Authority Having Jurisdiction

B. ATP - Acceptance Test Plan

C. AWS - Advanced Wireless Service

D. BDA - Bi-Direction Amplifier

E. CDMA - Code Division Multiple Access

F. CWDM - Coarse Wave Division Multiplexing

G. DAS - Distributed Antenna System

H. FCC - Federal Communications Commission

I. PSN - Public Safety Networks

1.7 SYSTEM DESCRIPTION

A. This section describes the technical and performance criteria for the installation of a distributed antenna system (DAS) capable of supporting public safety networks (PSN).

B. Performance Statement: This section and the accompanying design documents are performance based, describing the minimum material quality, required features, and operational requirements of the system. These documents do not convey every wire that must be installed and every equipment and connection that must be made. Based on the equipment constraints described and the performance required of the system, as presented in these documents, the Contractor is solely responsible for determining all wiring, programming, and miscellaneous equipment required for a complete and operational system.

1.8 BASE BID

A. Provided all pathway infrastructure to include conduit, fire-rated mechanical devices, ducting, wrap, junction boxes, enclosures, roof penetrations, antenna mast, and weather head as required to support a DAS system to meet all code requirements as called out in this specification and prescribed by the AHJ.

B. Provide full radio frequency sweep of completed structure after substantial completion of the building and prior to receiving final occupancy approval from the AHJ. Provide full test reports and evaluation to Owner/Architect/Engineer and AHJ for further evaluation of a full DAS system installation as required by code and prescribed by the AHJ.

1.9 ALTERNATES

A. Provide a DAS system as required by code and the prescribing AHJ following the test results as called out in this specification.

1.10 PROJECT RECORD DOCUMENTS

A. Submit data under provisions of Section 28 05 00.

B. Final As-Built Drawings: Include up-to-date drawings that include any changes made to the system during installation.

C. Submit certificate of completion of installation and service training from the system manufacturer.

D. Test reports confirming the project requirements have been met.

E. Test results on all cable runs.

F. Warranty: Submit written warranty and complete all Owner registration forms.

G. Complete all operation and maintenance manuals as described below.

1.11 OPERATION AND MAINTENANCE DATA

A. Submit data under provisions of Section 28 05 00.

B. Product Certificates: Signed by manufacturer of DAS equipment certifying that products comply with requirements.

C. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.

D. Manufacturer Certificates: Signed by manufacturers certifying the Contractor has complied with manufacturer requirements.

E. Field Tests Reports and Observations: Include record of final adjustments certified by Installer.

F. Maintenance Data: Include the following in maintenance manuals:

1. Operating instructions
2. Troubleshooting guide
3. Wiring terminal identification
4. Equipment parts list

1.12 WARRANTY

A. Contractor shall provide a one (1) year warranty of the installed system equipment defects in material and workmanship. All labor and materials shall be provided at no expense to the Owner during normal working hours. Warranty period shall begin on the date of acceptance by Owner/Architect/Engineer.

B. The warranty shall include emergency service and repair on site, with acknowledgment response time of four (4) hours from time of notification and on-site response within one (1) working day. The warranty shall include next day delivery of replacement parts required to make system operational.

C. Contractor shall submit an emergency repair plan to the Owner for acceptance prior the final acceptance.

1.13 ANNUAL SERVICE CONTRACT (PROVIDE AS AN ALTERNATE PRICE)

A. Provide annual cost for extended service and maintenance warranty, after the first year, for DAS according to the following terms:

1. The term of the warranty shall begin on the system acceptance date and shall continue for one (1) year. The extended service and maintenance warranty may begin following this first year if accepted by the Owner. The term may be automatically renewed for successive one-year periods unless canceled by the Owner. The service and maintenance agreement shall include the following basic services to the Owner, including all necessary parts, labor, and service equipment:

B. Repair or replace any DAS component item that fails to perform as initially installed, as specified, or as determined per the manufacturer's performance criteria.

C. Perform semi-annual preventive maintenance on the DAS system. This preventive maintenance shall include, but is not limited to, cleaning, realignment, inspection, and testing of all antennas and devices. The Owner shall receive a written report of these inspections that identifies the DAS status and, if required, a list of all necessary repairs or replacements.

1. The Contractor shall be compensated for any repairs or maintenance provided as a result of Owner abuse, misuse, intentional damage, accidental damage, or power fluctuations exceeding specified equipment tolerances.
2. System defects or failures shall be corrected within four (4) hours on the same business day if the Owner makes a service request before 11:00 a.m., or before 12:00 noon the next business day if the Owner makes the request after 11:00 a.m. If requested by the Owner, the Contractor shall respond or remain at the site after normal business hours, and the Owner shall reimburse the Contractor for the incremental cost difference between premium labor rates and standard labor rates. This reimbursement applies to premium labor rates that do not exceed time-and-one-half rates after normal business hours and double-time rates for Sundays and holidays. The Contractor's services shall be performed in a good and workmanlike manner and remain free from defects for a period of one (1) year.

D. Provide complete terms and conditions of warranty and service.

E. The Owner will enter into a contract directly with the Vendor. This specification is not a contract between the Owner and the Vendor to perform these services.

1.14 SYSTEM TESTING AND ACCEPTANCE

A. Inspection of the installed systems shall be made by the Owner and Architect/Engineer. If items from the design documents have been omitted or need changing per the requirements stated herein, they shall be noted in a punch list. The punch list will be expected to be fully complete within the time specified by the project. The system must be delivered, installed and accepted by Owner and Architect/Engineer. The acceptance criteria shall include, but not be limited to, the following:

1. Owner and Architect/Engineer will make an inspection, as deemed necessary, when notified by the Contractor that the equipment/ software, or any part thereof, is ready for acceptance.
2. After cutover of any portion of the system, the Contractor shall conduct acceptance test consistent with manufacturer's system performance specifications and as outlined in manufacturer's documentation.
3. Performance and reliability tests shall be conducted, demonstrating acceptable performance, over a full 30-day period after cutover.

4. Acceptance of the system shall be granted after all equipment has passed the tests contractually agreed to, has been in operation for 30 consecutive days without a major failure, and after proper system training as outlined within the contract documents has been conducted. In the event of a major failure, the Owner reserves the right to extend the acceptance date until such time that the installation complies with the 30 consecutive day major fault free requirement.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. CommScope / Andrew
2. Corning / Mobileaccess
3. ADRF

2.2 BASIC SYSTEM REQUIREMENTS

A. System shall include, but not be limited to, antennas, cabling, connectors, splitters, combiners, couplers, fiber optic cabling and connectors (if applicable), and bi-directional amplifiers to provide a complete system.

B. The system shall provide coverage for the PSN listed below:

1. 700/800 MHz to support police, fire and life safety

C. Contractor shall meet with Owner to identify which PSNs identified above will be servicing the facility. Contractor shall arrange a meeting with each PSN to propose their DAS system that can receive signals and get approval from each PSN prior to submitting final design documents to the Owner.

D. System shall be designed to support 24/365-day operation.

E. System Requirements:

1. The DAS system shall be designed to support the minimum received signal levels (RSL) of -95dBM within the facility. Facility coverage shall include 95% of the facility to include stairwells, elevators, basements, utility tunnels and garages if applicable.
2. The DAS shall support the following frequencies:

SERVICE	FREQUENCY UPLINK	FREQUENCY DOWNLINK
Lower 700 Band	698 - 716	728 - 746
Upper 700 Band	746 - 776	776 - 805
800 Band	806 - 824	851 - 869

F. Backup Power:

1. The system shall be provided with battery power where active equipment is located for not less than **24** hours upon loss of power for PSN system. System shall remain fully functional upon loss and return of power and not require a restart in any condition.

G. PSN Pathway Survivability:

1. All horizontal pathway shall meet a Level 1 survivability.
2. All vertical pathway shall meet a Level 2 survivability.
3. All headend devices shall be housed in a room that meets Level 2 survivability.

2.3 PRODUCTS

A. System Components: Listed below are the minimum products required for this system installation. Contractor shall provide a complete installation utilizing these devices and any other equipment / device necessary to provide a complete turn-key installation.

1. Base unit
2. Remote cabinet
3. System controller
4. Bi-directional amplifier
5. System controller
6. Cable, connectors, splitters, combiners

B. Base Unit:

1. The base unit performs RF to optical signal conversion. The unit is available in multiple port configurations.

C. Bi-Directional Amplifier:

1. Bi-directional amplifier is used to ensure and filter signal levels between the RF source and base unit. The BDA is available in multiple port configurations and can be mounted to the wall or equipment rack.

D. Antennas:

1. Shall support multi-band and accommodate all frequencies identified above.
2. Be either omni or directional indoor and/or outdoor.

E. Cable, Connectors, Splitters, Combiners, Etc.:

1. Refer to Section 28 05 00 for plenum or non-plenum cable rating requirements.
2. Coaxial Cable:

F. Cable shall be air dielectric.

G. Outer material shall be corrugated aluminum or copper.

H. Refer to manufacturer specifications on cable type for each antenna application.

1. Splitters, Combiners, Taps, Connectors:

I. Refer to manufacturer specifications for additional information.

PART 3 - EXECUTION

3.1 GENERAL

A. Install all equipment and components in accordance with manufacturer's written instruction, in compliance with recognized industry practices to ensure that all items comply with specifications.

B. Within the warranty period, Contractor shall effect replacement of defective parts within one (1) business day after receiving notification of a problem.

C. Provide the Owner with any additional warranties offered by the manufacturer.

D. The Contractor shall receive and stage all equipment at their facility. During this time, the equipment will be tested, burned in, and configured.

E. This Contractor shall be responsible for all correspondence between the wireless service providers, Owner and Architect/Engineer to provide a complete installation.

3.2 INSTALLATION

A. Contractor shall furnish and install all equipment, miscellaneous parts, accessories and programming to provide a complete and fully operational in-building distributed antenna system.

B. Contractor shall provide all necessary pathways required by the wireless service providers to support their systems to include any pathways to the roof to support antenna cabling distribution by the DAS.

3.3 TRAINING

A. Contractor shall provide training on all systems provided. Training sessions shall be on site, limited to 15 people maximum in any one session. Training shall be scheduled at the Owner's convenience. Sessions shall last approximately two (2) hours each. In addition, Contractor shall provide a minimum of eight (8) hours training for the system administrator.

B. Follow-up training shall be provided for the systems a minimum of 30 days after cutover. Contractor shall coordinate times with Owner.

C. If Contractor is not able to provide training as described, Contractor shall arrange for a representative from the manufacturer to provide training at the Contractor's expense.

3.4 FINAL CHECKOUT AND ACCEPTANCE

A. Contractor shall verify that the system is complete and fully operational before requesting final approval and before scheduling system demonstration.

B. Contractor shall be available to demonstrate the operation and use of the system to the Architect/Engineer and to the Owner's representatives.

C. Contractor shall furnish three (3) complete record manuals to the Owner.

END OF SECTION 28 05 37

SECTION 28 13 00 - ELECTRONIC ACCESS CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Server

B. Client Workstations

C. Field Control Hardware

D. Application Software

E. Access Control Graphical User Interface

F. Credentials and Badging

G. Portal Devices

1.2 RELATED WORK

A. Section 08 71 00 - Door Hardware

B. Section 26 05 13 - Wire and Cable

C. Section 26 05 33 - Conduits and Boxes

D. Section 26 05 35 - Surface Raceways

E. Section 27 05 26 - Communications Bonding

F. Section 27 05 28 - Interior Communication Pathways

G. Section 27 05 53 - Identification and Administration

H. Section 27 15 00 - Horizontal Cabling Requirements

I. Section 28 05 00 - Basic Electronic Safety and Security System Requirements.

J. Section 28 23 00 - Video Surveillance

K. Section 28 31 00 - Fire Detection and Alarm Systems.

1.3 QUALITY ASSURANCE

A. Manufacturer: The manufacturer shall have a minimum of ten (10) years documented experience in the development and manufacture of access control software and hardware. The software developer shall be, at a minimum, a Microsoft Silver Certified Integrator and Partner for those systems that reside in a Microsoft environment.

B. Contractor:

1. Shall be a factory-authorized installation, service and support company specializing in the selected manufacturer's product, with demonstrated prior experience of a minimum of ten (10) years installing, programming and supporting the selected manufacturer's system.
2. Shall have been in business for a minimum of ten (10) years and shall have installed a minimum of three (3) similar or larger sized systems. Contractor shall have a minimum of two (2) service technicians who are certified in the proposed manufacturer's system.
3. Shall retain the services of a minimum of one employee with the following certification(s) or education Should more than one certification be required, one employee may maintain multiple certifications.

    a. A certification of RCDD from BICSI or CNIDP from CNet.
    b. A certification of MCSA: Server or MCSE: Server Infrastructure from Microsoft.
    c. A certification of CCENT or CCNA from CISCO. CCNP certification satisfies either of these requirements.

C. Material:

1. All material which is Contractor furnished shall be new, unused and free from defects.
2. Where more than one of any specified item of equipment or material is used, all such items shall be the same product from the same manufacturer.

1.4 REFERENCES

A. International Building Code

B. NFPA 70 - National Electrical Code.

C. The BOCA National Building Code

D. UL 294 - Standard for Access Control Systems.

E. UL 464 - Standard for Audible Signal Appliances.

F. UL 603 - Standard for Power Supplies for Use with Burglar Alarm Systems.

G. UL 827 - Standard for Central Station Alarm Services.

H. UL 1449 - Standard for Surge Protective Devices.

I. UL 1635 - Standard for Digital Alarm Communicator Systems.

J. UL 1638 - Standard for Visual Signaling Appliances – Private Mode Emergency and General Utility Signaling.

K. UL 1778 - Uninterruptible Power Systems.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 28 05 00.

B. Product Data Submittal: Provide manufacturer's technical product specification sheet for each individual component type. Submitted data shall show the following:

1. Compliance with each requirement of these documents. The submittal shall acknowledge each requirement of this section, item-by-item.
2. All component options and accessories specific to this project.
3. Electrical power consumption rating and voltage including UPS sizing.
4. Heat generation for all power consuming devices.
5. Wiring requirements.
6. Server processor(s), workstation configurations, total and available disk space, and memory size.
7. All network bandwidth, latency and reliability requirements.
8. Backup/archive system size and configuration.
9. Submit two of each type of credential to be used (access card, key fob, etc.).

C. System Drawings: Project-specific system CAD drawings shall be provided as follows:

1. Provide a system block diagram noting system components and interconnection between components. The interconnection of components shall clearly indicate all wiring required in the system. When multiple pieces of equipment are required in the exact same configuration (e.g., multiple identical controllers), the diagram may show one device and refer to the others as "typical" of the device shown. The diagram shall list room numbers where each controller will be located. This block diagram shall be provided in Adobe PDF.
2. Provide a schedule of all controllers and the doors/points each controller controls. This schedule shall be provided in Adobe PDF.
3. Provide schedules describing each system input location by an architecturally familiar reference, e.g., Door 312A. The architectural door schedule shall be used as the basis. These schedules shall be provided in Adobe PDF

D. Submit sample format of site specific programming guides to be used for system planning/programming conference with Owner. These guides shall be provided in Adobe PDF.

E. So that required Owner personnel are present at the planning/programming conference required in Part 3 of this section, submit meeting agenda for the conference a minimum of two weeks prior to the conference.

F. Submit detailed description of Owner training to be conducted at project end, including specific training times. Refer to Part 3 of this section for details.

G. IP Addresses: Contractor shall provide to Owner, in a documented transmittal and in Microsoft Excel format, the names and locations of devices which require an IP address. An authorized representative of the Owner shall furnish the addresses for the associated devices in Microsoft Excel format in a documented transmittal. Should Owner change the IP address structure after approval of the list, Owner may be responsible for additional fees involved with reprogramming.

H. Quality Assurance:

1. Provide materials documenting experience requirements of the manufacturer and Installing Contractor. Provide documentation of the training and other applicable certifications of the Contractor.
2. Provide system checkout test procedure to be performed at acceptance. Test procedures shall include all external alarm events.

1.6 SYSTEM DESCRIPTION

A. This section describes the furnishing, installation, programming and commissioning of a complete, turnkey access control system. The terms "access control system" and "security management system", or SMS, may be used interchangeably herein.

B. The company, manufacturer, and product names used in this section are for identification purposes only. All trademarks and registered trademarks are the property of their respective owners.

C. Performance Statement: This section and the accompanying access control-specific design documents are performance based, describing the minimum material quality, required features, and operational requirements of the system. These documents do not convey every wire that must be installed and every equipment connection that must be made. Based on the equipment constraints described and the performance required of the system, as presented in these documents, the vendor and the Contractor are solely responsible for determining all wiring, programming, and miscellaneous equipment required. The Contractor shall be responsible for determining quantities of materials required for a complete and operational system. Floor plan drawings and schedules have been developed to aid the Contractor in determining device quantities and installation locations, but, where discrepancies between floor plans and schedules arise, the greater number shall govern.

D. Basic System Description:

1. The access control system shall provide the following functionality:

a. Electronic control access to designated areas.
b. Validation of cardholder credentials by use of personnel database, card formats. The system shall compare the time, location, and unique credentials of an attempted entry with information stored in the database.
c. Access to designated areas will be validated only when a user's credential has a valid number for its facility and the number is valid for the current time and for the reader where it is used.
d. The system software shall access the hardware that validates the person and monitors the security of a building by use of intelligent system controllers, reader interfaces, locks, readers, inputs and outputs. When access has been validated, a signal to the portal locking device shall be activated to enable alarm free access at that location.
e. The system shall be configured by use of application software.
f. The system shall monitor activities using operator monitoring software which includes graphical maps which display alarms, status and activity.

g. The system shall differentiate and restrict administrative and operational access through use of password authentication.
h. The system shall report on various aspects of the system by use of reports, both default and customizable. Reports shall be able to be printed.
i. The system shall have the capability to report alarms both audibly and visually.
j. The system shall control hardware from the monitoring station by use of manual actions and events.
k. The system shall provide record and data management by use of journals. There shall be a full audit trail.
l. The system shall allow for data to be imported from other products by use of database migration tools. These products may include Human Resources databases for name and/or time and attendance information, information from previous access control systems consisting of badge numbers from credentials that will be re-used, Microsoft Excel spreadsheets, or other systems as defined herein.
m. The system shall allow access using a web interface or a mobile application for use on the iOS and Android operating systems.

E. Integrations, Software Development Kit (SDK) and Application Programming Interface (API):

1. The manufacturers of the systems that are integrated shall make an SDK available to other manufacturers.
2. Prior to the release of this section, the manufacturers of the systems that are to be integrated shall have made available to each other all APIs to perform the specific integrated functions required in this section.
3. The integrations shall be completed and tested, and shall have been implemented on at least one system of similar size prior to the release of this section. The integrations shall not be accomplished for the first time for this project unless written pre-approval has been granted by Owner to Contractor prior to bid deadline.
4. During the warranty period, should a new API or version of software be released by the SMS manufacturer or any of the manufacturers of systems or devices that are integrated, that API or version of software shall be installed in the appropriate system or device defined in this section at no charge to Owner. Should any loss of functionality in the integration be exposed through this installation, as compared to the accepted system, Contractor shall correct the functionality at no charge to Owner.
5. Any and all development costs for specified functionality or inter-system integrations shall be included in the Contractor's bid. No additional costs or fees for the integrations shall be charged to Owner from the time of notice to proceed through system acceptance.

1.7 OWNER FURNISHED MATERIAL

A. Telephone service

B. Data circuit / internet service

C. Active telephone service equipment, such as key system, PBX or VOIP switch equipment

D. Active computer network equipment:

1. Routers
2. Switches
3. Hubs
4. Wireless access points
5. Uninterruptible power supplies for Owner furnished products

E. Active computer equipment:

1. SMS server - refer to Part 2 for details
2. SMS workstation(s) - refer to Part 2 for details
3. SMS badging station(s) - refer to Part 2 for details
4. Uninterruptible power supplies for Owner furnished products

F. Credentials:

1. Badges
2. Key fobs
3. Adhesive tags
4. Active transmitters

1.8 LICENSING REQUIREMENTS

A. All user licenses required for system operation shall be included in the Contractor's bid. User licenses shall include server and workstation software, network controllers, card readers, printers, badging stations, and any other licensing that is required by the manufacturer for operation of any system component.

1. Licenses shall be provided on a one-to-one basis. One license shall be provided for each device requiring a license. In the event the manufacturer requires the purchase of a block of licenses, license blocks provided shall be no greater than what is required for the number of devices in this project. Contractor shall document the number of remaining licenses in the project record documents and Operations and Maintenance data.
2. In addition to the licensing requirements listed above, provide licensing and configuration of system administration/operation software for 2 workstations. The workstation licenses shall be concurrent use seats, and the client software shall be able to be loaded on an unlimited number of workstations at no extra cost to the Owner. Contractor shall install client software on the same number of machines as licenses provided. As part of the training, Contractor shall demonstrate to Owner how to install client software on additional workstations.

3. All Contractor-furnished software shall contain a perpetual, permanent license in which no other fees beyond the single payment for the work of this section are required in order to use the proposed software indefinitely. Owner understands that, after the initial warranty period has expired, maintenance and technical support fees may be required annually, quarterly, or monthly in order to receive software updates and technical support. However, it remains the option of Owner to purchase or decline this service. If Owner chooses to discontinue or never purchase this service, the software shall continue to be legally licensed for use. All software shall be the latest version released, and all Contractor-furnished servers and workstations shall be current on all patches and updates for all software on the machines at the time of acceptance of the associated systems.
4. The SMS shall require only a single license key present on the server for the SMS to operate. The key shall be a physical device or a software key. License keys shall not be required at the client workstations.

1.9 PROJECT RECORD DOCUMENTS

A. Submit documents under the provisions of Section 28 05 00.

B. Provide final system block diagram showing any deviations from shop drawing submittal.

C. Provide statement that system checkout test, as outlined in the shop drawing submittal, is complete and satisfactory.

D. Provide schedules documenting:

1. Controller installation locations including specific door numbers being controlled.
2. All terminal block wiring, including cable numbers.

E. Warranty: Submit written warranty and complete all Owner registration forms.

F. Complete all operation and maintenance data manuals as described below.

1.10 OPERATION AND MAINTENANCE DATA

A. Submit documents under the provisions of Section 28 05 00.

B. Manuals: Final copies of the manuals shall be delivered within 14 days after completing the installation test. Each manual's contents shall be identified on the cover. The manual shall include names, addresses, and telephone numbers of the contractor responsible for the installation and maintenance of the system, and the factory representatives for each item of equipment for each system. The manuals shall have a table of contents and labeled sections. The final copies delivered after completion of the installation test shall include all modifications made during installation, checkout, and acceptance testing. Manuals shall be submitted in both hardcopy and electronic format**.** The manuals shall consist of the following:

1. Hardware Manual: The manual shall describe all equipment furnished including:

a. General description and specifications.

b. Installation and check out procedures.
c. System and equipment layout and electrical schematics to the control board and field device level. For multiple devices wired identically, only one wiring diagram is required per door configuration, to be labeled "TYPICAL".
d. Alignment and calibration procedures.
e. Manufacturers repair parts list indicating sources of supply.

2. Software Manual: The software manual shall describe the functions of all software and shall include all other information necessary to enable proper loading, testing, and operation. The manual shall include:

a. Definition of terms and functions.
b. System use and application software.
c. Initializations, startup, and shutdown procedures.
d. Reports generation.
e. Details on forms customization and field parameters.

3. Operator's Manual: The operator's manual shall fully explain all procedures and instructions for the operation of the system including:

a. Computers and peripherals.
b. Log in/Log out procedures.
c. Use of system, command, and applications software.
d. Recovery and restart procedures.
e. Graphic alarm presentation.
f. Use of report generator and generation of reports.
g. Data entry.
h. Operator commands.
i. Alarm messages.
j. System permissions functions and requirements.

4. Maintenance Manual: The maintenance manual shall include descriptions of maintenance for all equipment including inspection, cleaning, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

1.11 WARRANTY

A. Unless otherwise noted, provide warranty for one (1) year after date of Substantial Completion for all materials and labor.

B. Onsite Work During Warranty Period: This work shall be included in the Contractor's bid and performed during regular working hours, Monday through Friday.

1. Inspections: The Contractor shall perform two minor inspections at six-month intervals (or more often if required by the manufacturer), and two major inspections offset equally between the minor inspections to effect quarterly inspection of alternating magnitude.

2. Minor Inspections: These inspections shall include:

    a. Visual checks and operational tests of all equipment, field hardware, and electrical and mechanical controls.
    b. Mechanical adjustments if required on any mechanical or electromechanical devices.

3. Major Inspections: These inspections shall include all work described under paragraph Minor Inspections and the following work:

    a. Clean all equipment, including exterior surfaces and accessible and serviceable interior surfaces.
    b. Perform diagnostics on all equipment.
    c. Check, test, and calibrate (if required) all sensors.
    d. Run all system software diagnostics and correct all diagnosed problems.

C. Operation: Upon the completion of any scheduled adjustments or repairs, Contractor shall verify operation of the SMS.

D. Service: The Owner will initiate service calls when the SMS is not functioning properly. If requested by the Owner, the Contractor shall respond or remain at the site after normal business hours, and the Owner shall reimburse the Contractor for the incremental cost difference between premium labor rates and standard labor rates. This reimbursement applies to premium labor rates that do not exceed time-and-one-half rates after normal business hours and double-time rates for Sundays and holidays. The Owner shall be furnished with telephone number(s) where service personnel can be reached 24/7/365. Qualified service personnel shall be at the site within 12 hours after receiving a request for service.

E. Records, Logs and Work Requests: Contractor shall keep records and logs of each task completed under and outside of warranty. These logs shall be maintained in Microsoft Word or Excel. The log shall include the model and serial number identifying the component involved, its location, date and time the call was received, specific nature of trouble, names of service personnel assigned to the task, description of work performed, the amount and nature of the material used, and the time and date of commencement and completion of the work. Complete logs shall be kept and shall be available for review on site, demonstrating that planned and systematic adjustments and repairs have been accomplished for the SMS. The Contractor shall deliver a record of the work performed within three (3) business days after work is completed. Defective items that have been replaced shall be given to the Owner. Should the replacement item be a temporary replacement until the removed item is repaired, Contractor shall retain possession of the defective item for repair and subsequent re-installation.

F. System Modifications: Modifications by the Contractor are allowed after system acceptance. Contractor shall make recommendations for system modification in writing to the Owner. No system modifications shall be made without prior, written approval of the Owner. Any modifications made to the system shall be incorporated into the Operations and Maintenance Manuals, and other documentation affected. The Owner shall be provided with electronic restorable versions of all configurations prior to the modifications being made.

G. Software: At no charge, the Contractor shall provide to Owner all updates released by the manufacturer during the period of the warranty and verify operation of the system upon installation. These updates include system software updates, patches, bug fixes and revisions, as well as firmware updates. These updates shall be accomplished in a timely manner, fully coordinated with SMS administrators and operators, shall include training for the new changes/features, and shall be incorporated into the Operations and Maintenance Manuals and software documentation.

H. Refer to the individual product sections for further warranty requirements of individual system components.

1.12 ANNUAL SERVICE CONTRACT

A. Provide annual cost for extended service and maintenance agreement after the first year for the access control system according to the following terms:

1. The term of the warranty shall begin on the system acceptance date and shall continue for one (1) year. The extended service and maintenance warranty shall begin following this first year if accepted by the Owner. The term shall be automatically renewed for successive one-year periods unless canceled in writing by the Owner with Contractor confirmed receipt, up to the date of expiration. The service and maintenance agreement shall include the following basic services to the Owner, including all necessary parts, labor and service equipment:

    a. Repair or replace any security equipment item that fails to perform as initially installed, as specified, or as determined per the manufacturer's performance criteria.
    b. Perform preventive maintenance on the security equipment during the 6th month and 12th month of the service contract. This preventive maintenance shall include cleaning, realignment, inspection, and testing of security devices. The Owner shall receive a written report of these inspections that identifies the security system's status and, if required, a list of all necessary repairs or replacements.
    c. Provide maintenance on the SMS system software. At no charge, the Contractor shall provide to Owner all updates released by the manufacturer during the period of the service contract and verify operation of the system upon installation. These updates include system software updates, patches, bug fixes and revisions, as well as firmware updates. These updates shall be accomplished in a timely manner, fully coordinated with SMS administrators and operators, shall include training for the new changes/features, and shall be incorporated into the Operations and Maintenance Manuals and software documentation. Contractor shall not be responsible for maintenance of Owner data.

2. The Contractor shall be compensated for any repairs or maintenance provided as a result of Owner abuse, misuse, intentional damage, accidental damage, or power fluctuations exceeding specified equipment tolerances.

3. Service: The Owner will initiate service calls when the SMS is not functioning properly. If requested by the Owner, the Contractor shall respond or remain at the site after normal business hours, and the Owner shall reimburse the Contractor for the incremental cost difference between premium labor rates and standard labor rates. This reimbursement applies to premium labor rates that do not exceed time-and-one-half rates after normal business hours and double-time rates for Sundays and holidays. The Owner shall be furnished with telephone number(s) where service personnel can be reached 24/7/365. Qualified service personnel shall be at the site within 24 hours after receiving a request for service.

B. Provide complete terms and conditions of warranty and service.

C. The Owner will enter into a contract directly with the vendor. This specification section is not a contract between the Owner and the vendor to perform these services.

PART 2 - PRODUCTS

2.1 ELECTRONIC ACCESS CONTROL SYSTEM MANUFACTURERS

A. Genetec Synergis

B. Johnson Controls P2000

C. Lenel OnGuard

D. RS2 Access It Universal

E. S2 Extreme/Enterprise

F. Software House C-Cure 9000

G. Should the access control manufacturer offer, as an option, the use of hardware by Mercury Security, the Contractor proposed solution shall utilize this hardware. Contractor shall state whether or not the software is compatible with the SCP, AP and EP families of Mercury Security hardware. For future additions or defective hardware replacements, the system shall not be "locked" to require Mercury Security hardware be purchased only from the access control software manufacturer or from the original Installing Contractor.

H. Approval of Alternate Manufacturers:

1. Contractors seeking approval for alternate manufacturers for any devices or software in this section shall submit requests for approved equals as defined by Division 1 in addition to submitting:

    a. Bill of materials for each piece of hardware and software proposed.
    b. Manufacturer's data sheet for each piece of equipment proposed.

c. Line-by-line typewritten statement of compliance or non-compliance comparing Part 2 of this section with the published specifications of the proposed alternate products. This compliance statement shall be signed by an officer of the local contractor branch office that proposes to install the alternate product and either an officer of the manufacturer or an officer of the manufacturer's representative.

2. Refer to the project drawings for manufacturer and model numbers for the Basis of Design products.

2.2 SERVER

A. The system shall not be required to have a traditional or virtual server and, instead, may be provided with embedded server functionality integral to the controller if the following three (3) conditions are met. The server specified below shall apply if the system does not meet these three (3) conditions:

1. The network controller is a distributed architecture, native IP network appliance.
2. The network appliance contains an onboard, embedded operating system (e.g., Linux-based), web server, ODBC-compliant database engine, data storage device and application logic controller.
3. The network appliance contains onboard SSL communications.

B. If the system architecture utilizes traditional servers, the system shall be a true multi-tasking, multi-threading application system architecture designed specifically for the Windows environment. All modules, including access control, alarm monitoring, credential management, etc., shall be built from a single unified 32-bit source code set.

C. The system shall communicate on a TCP/IP based Ethernet LAN capable of utilizing 10/100/1000 BaseT.

D. The system shall be functional in a virtual server environment.

E. Provisioning:
1. The server shall be furnished by the Contractor and shall meet the specifications defined by the SMS software manufacturer to meet or exceed the functionality and performance specifications of the system and integrations defined in this and related sections. Contractor shall coordinate with Owner for possible requirements to utilize a specific manufacturer. Contractor furnished server shall have a three (3) year limited warranty.Acceptable manufacturers of Contractor-furnished server are:

a. Dell -Basis of Design Power Edge R730 Series
b. HP
c. Iomnis
d. Approval of Alternate Manufacturers:

1) Contractors seeking approval for alternate manufacturers for the server in this section shall submit requests for approved equals as defined by Division 1 in addition to submitting:

a) Bill of materials for each piece of hardware proposed.
b) Manufacturer's data sheet for each piece of equipment proposed
c) Line-by-line typewritten statement of compliance or non-compliance comparing Part 2 of this section with the published specifications of the proposed alternate products. This compliance statement shall be signed by an officer of the local contractor branch office that proposes to install the alternate product and either an officer of the manufacturer or an officer of the manufacturer's representative.

2) Refer to the project drawings for manufacturer and model numbers for the Basis of Design products.

F. Hardware:

1. Enterprise class server.
2. Rack mount configuration.
3. Six (6) USB 2.0 ports, one (1) two port 10/100/1000 Ethernet NIC.
4. Dual, redundant, hot swappable power supplies.
5. RAID Level 5 configuration with separate drives for data base, 500GB, and operating system, 500GB. One spare hot swappable hard drive for the database and one for the operating system.
6. Enterprise class hard drives, minimum 7200 RPM, 3.5" SATA, minimum mean time between failure, MTBF, 1.2 M hours, 100% duty cycle 24x7.
7. 8 GB RAM.
8. Internal DVD+/- RW ROM SATA drive.
9. On board HDMI video card.
10. Predictive failure analysis.
11. Two (2) cooling fan modules, each with two fans, hot swappable.
12. Rack mount LCD monitor with integrated keyboard, touchpad and KVM switch. This monitor, keyboard and touchpad may also serve the video management system server, if present, through the KVM switch.
13. Backup Power:

    a. Owner-furnished uninterruptible power supply (UPS) with surge suppression.

G. Operating System:

1. Windows Server 2003 SP2 or higher
2. Windows Vista Business
3. Windows Vista Enterprise
4. Windows Vista Ultimate
5. Windows Server 2008
6. Windows Server 2008 R2
7. Windows 7 Professional
8. Windows 7 Enterprise
9. Windows 7 Ultimate
10. Windows 8.1
11. Windows 8.1 Professional

H. Database:

1. SQL Server 2008 R2 Express Edition
2. SQL Server 2008 R2 Standard
3. SQL Server 2008 Enterprise
4. SQL Server 2005 Express Edition
5. SQL Server 2005
6. Oracle 11g R1 Server
7. Oracle 11g R2 Server
8. Oracle 10g R1 Server
9. Oracle 10g R2 Xe

I. The SMS software shall utilize the native Windows security features and be registered with the Windows operating system as a service. The security features shall be configured with the following layers:

1. Workstation: Prohibits non-operators from accessing the system.
2. Desktop: Controls which applications a given operator can run.
3. Applications Commands: Controls which commands within an application a given operator can perform.
4. Files: Controls an operator's read/write access rights to individual files.
5. Breakthrough Alarms: The operating system shall allow high priority alarm condition notification regardless of the application software currently opened.

J. Upgrades or expansion of the SMS to a larger size system in scale shall not require installation of a different and/or new SMS application or require the administrator/operator to learn a different and/or new interface from the previous version.

K. Associated Software:

1. Support for web client.
2. Support for mobile client.

2.3 CLIENT WORKSTATIONS

A. Provisioning:

1. The workstation(s) shall be furnished by the Contractor and shall meet the specifications defined by the SMS software manufacturer to meet or exceed the functionality and performance specifications of the system and integrations defined in this and related sections. Contractor shall coordinate with Owner for possible requirements to utilize a specific manufacturer. Contractor furnished workstation(s) shall have a three (3) year limited warranty.
2. Contractor shall install client software on up to 2 workstations.

B. Hardware:

1. Desktop configuration
2. Pentium 4 Dual Core CPU, 2.5 GHz or greater
3. 4 GB RAM

4. 100GB hard drive, 7200 RPM
5. Four (4) USB 2.0 ports, single 10/100/1000 network interface card
6. Audio with integrated speakers.
7. One (1)23" flat screen LCD monitor(s)
8. USB keyboard, USB optical mouse
9. Three (3) year limited warranty
10. Dedicated 256 MB SVGA accelerated video card
11. 16x DVD/CD RW drive

C. Operating System:

1. Windows 8.1 Professional
2. Windows 10 Professional

2.4 FIELD CONTROL HARDWARE

A. Interior Control Panels:

1. Control boards, power distribution and terminals shall be enclosed in a NEMA 1 rated enclosure that is key lockable. Contractor shall not furnish padlock. All enclosures that are part of this project shall be keyed alike. Contractor shall furnish and install a mechanically fastened tamper switch on the interior of the enclosure.
2. Control boards are allowed to be in an enclosure separate from the power supplies/power distribution. Should they be in separate enclosures, the interface wiring shall be in rigid metallic conduit, RMC, with Myers hubs at both ends of the conduit.
3. Control panels shall be rack mountable in an enclosure specifically for rack mounting. Control boards and power supplies shall be located in the enclosure. The enclosure shall have screw or compression terminals on the rear panel for connection of field devices.
4. Intra-enclosure wiring shall be dressed using tie wraps and/or covered plastic wire way. Hook-up wires for identical purposes shall have the same color insulation. For example, if one input pair utilizes green and white insulated conductors, all similar inputs shall use green and white insulated conductors. The same color scheme shall be followed for all access control panels that are part of this project.
5. Cabling from field devices such as readers, door position switches, request-to-exit devices and locking devices shall not be directly terminated to the control boards and power supplies. The field devices shall be terminated to terminals located on the left side, right side or both sides of the enclosure back panel. Intra-enclosure wiring shall be routed from the terminals to the control boards and power distribution. Quantity and functional sequence of the terminals shall be identical portal to portal.
6. All devices inside the enclosure, less cabling and batteries, shall be mechanically fastened to a removable solid or perforated metal back panel with either:

    a. Metal or plastic standoffs
    b. DIN rail

7. Hook and loop fasteners, double sided tape or adhesives are not allowed to attach devices to the back panel. Mounting devices to the interior of the door shall only be allowed when the following two (2) conditions are met:

    a. The access control hardware manufacturer offers prefabricated enclosures with devices mounted to the interior of the door.
    b. Only the same devices that the access control manufacturer mounts to the interior of the door are allowed to be mounted in a different enclosure, and those devices shall be mounted in an identical manner.

8. 120V 20A input power shall be hard wired to a circuit breaker disconnect and to one duplex receptacle on the interior of the enclosure. Should devices in the enclosures require plug-in transformers/power supplies, the receptacle shall be utilized. One (1) power strip with integrated circuit breaker shall be located in the bottom of the enclosure as needed.
9. Power to the locking devices shall be provided by a power distribution board with no fewer than four (4) outputs. Each lock shall be individually protected. The power distribution board shall:

    a. Provide protection with fuses or positive temperature coefficient (PTC) devices.
    b. Provide control so that each output is individually selectable as latching or non-latching with fire alarm activation.
    c. Provide control so that each output shall have Fail Safe and Fail Secure terminals.
    d. Provide a fire alarm input with associated trigger LED.
    e. Provide an individual LED per output to indicate when an input has been triggered and the associated output has been activated.
    f. Accept a dry, closed contact input to activate the individual lock outputs.
    g. Provide a dry, Form C relay that energizes on activation of the fire alarm input. This output may then be used as a fire alarm input to other power distribution boards in the same or a different enclosure, or may provide input to another device such as a multi-pole relay.

10. A minimum of four (4) 12V 7 AH rechargeable, sealed, lead acid batteries shall be located in the bottom of the enclosure. Two of the batteries shall be connected in series for 24V devices, and two batteries shall be connected in parallel for 12V devices. Connections to the batteries shall be made with appropriate terminals crimped on the connecting conductors. Batteries shall be clearly labeled in a permanent manner with the date of installation.
11. Power to control boards, readers and auxiliary devices such as request-to-exit motion detectors shall be provided by a power distribution board with no fewer than four (4) outputs. All devices powered by the same voltage at an individual portal shall be protected by the same fuse or PTC unless current requirements dictate otherwise. Individual fuses or PTCs may protect more than one control board.
12. All access control panels, when populated with control boards and power supplies, shall have the following capacities:

    a. Control of a minimum of two (2) portals.

b. Spare capacity of a minimum of one (1) access control portal, two (2) auxiliary inputs and two (2) auxiliary outputs greater than the requirements of the project at the time of system specification.
c. Five (5) spare fuses of each type used, to be in their original packaging, to be located in each power supply enclosure.
d. 50% spare current capacity on all power supplies located in unconditioned spaces and 40% spare capacity for those in conditioned spaces. Lower spare capacities are allowable based on prior approval of Contractor-provided power calculations.

13. Locations where enclosures may be mounted are shown on the plans. Final location, with approval of Owner's representative, shall be selected by Contractor based on distribution of controlled portals and devices.
14. At time of Substantial Completion, Contractor shall furnish a schematic diagram of intra-enclosure wiring and a complete bill of materials for the enclosures and the devices located within. This documentation shall include a schedule of fuses and the device(s) that each fuse protects. This documentation shall be placed by Contractor in a Contractor-furnished print pocket located on the inside of the enclosure door.

B. Reader Interface Module (RIM):

1. Reader interface modules are not shown on the plans. Refer to the installation section of this specification for allowable equipment mounting locations. It is the responsibility of the Contractor to determine the number and configuration of reader interface modules required based on the inherent characteristics of each product line and the requirements and restrictions described in this document.
2. RIM shall interface with and accept data from TTL, Wiegand and RS-485 type readers and door hardware.
3. RIM shall provide a minimum of three (3) inputs per portal for portal position, request to exit and auxiliary input.
4. RIM shall provide a minimum of two (2) outputs per portal for locking device and auxiliary output. Each output shall be Form C and shall be rated at 3A at 28VDC.
5. RIM shall communicate to controller by RS-485.

C. Input Control Module (ICM):

1. The input control module shall provide supervised and non-supervised alarm input zones and monitor/report line fault conditions, alarm conditions, power faults and tampers.
2. Input control modules are not shown on the plans. Refer to the installation section of this specification for allowable equipment mounting locations. It is the responsibility of the Contractor to determine the number and configuration of input control modules required, based on the inherent characteristics of each product line and the requirements and restrictions described in this document.
3. UL 294 and 1076 listed.
4. Each input configurable for normally open or normally closed.
5. Each input configurable for timing.
6. Each input configurable for end of line resistance.
7. Status LEDs for communication to the host, heartbeat and input status.
8. Communications line supervision.

9. AES 128 bit encryption.
10. 2-wire RS485 communications.
11. No fewer than eight (8) inputs per board/control module.
12. Assignment of unit addresses and communications speed.
13. Alarm Masking: The ability to mask the alarm input on a time zone basis.
14. Activate Output: The ability for any input to activate any output.
15. Configuration of Debounce Time: The ability to control the amount of time that an input state change must remain consistent in order for it to be considered a real change of state.
16. Elevator control support for number of floors shown on the drawings.
17. Noise rejection filtering to prevent false alarms.
18. Global Linkage: The ability to link outputs with inputs that are attached to any ICM/output control module (OCM).
19. Checkpoint: The ability to configure an input as a designated stop on one or more guard tours.
20. Entry/Exit Delay: The ability to set up entry/exit delays for inputs that are attached to any ICM. This shall include:

    a. Non-Latched Entry: When an input activates, the alarm will not be reported until the entry delay expires. If the input is still active when the entry delay expires, the alarm will be reported. If the input is not active when the entry delay expires, then the alarm will not report.
    b. Latched Entry: When an input activates, the alarm will not be reported until the entry delay expires. If the input is still active when the entry delay expires and the alarm has not been masked, the alarm will be reported. If the input has been masked when the entry delay expires, then the alarm will not report.
    c. Exit Delay: When an input activates, the alarm will not be reported (operates as if masked) until the exit delay expires. If the input is still active when the exit delay expires, the alarm will be reported. If the input is not active when the exit delay expires, the alarm will not be reported.

D. Output Control Module (OCM) and Functionality:

1. Output control modules are not shown on the plans. Refer to the installation section of this specification for allowable equipment mounting locations. It is the responsibility of the Contractor to determine the number and configuration of output control modules required, based on the inherent characteristics of each product line and the requirements and restrictions described in this document.
2. The output control module(s) shall provide Form C relay contacts for load switching, rated at 3A at 28VDC.
3. Each relay shall support "On" "Off" and "Pulse."
4. Outputs can be pulsed from 0.1 seconds to 24 hours.
5. Status LEDs for communication to the host, heartbeat and relay status.
6. 2-wire RS485 communications.
7. No fewer than eight (8) outputs per board/control module.
8. Communications line supervision.

2.5 APPLICATION SOFTWARE

A. General Performance:

1. The application software, in conjunction with the associated hardware, shall have the following features, functionality and capabilities. The functions that are to be implemented shall be determined in the planning conference between Contractor and Owner referenced in Part 3 of this section.
2. All Users:

    a. All users shall be capable of being authenticated against Active Directory using LDAP before being granted system access. Should the Owner not use Active Directory, the system shall provide a built-in login and credential management tool to permit rules-based access rights on a per-user basis.
    b. The access rights shall be selectable on a per-user basis. In addition, user groups shall be capable of being assigned whereby each user group has a common set of access rights. Users shall be capable of being assigned to these user groups by the system administrator.

3. Operators:

    a. The SMS operator interface shall be standard Windows style graphical interface allowing point and click access to features such as drop-down menus, radio buttons, check boxes, list boxes and other standard Windows components.
    b. On-line Context Sensitive Help: The SMS shall provide on-line context sensitive help files to guide system administrators and system operators in the configuration and operation of the SMS. The help menu shall be available from any window in the SMS by pressing one function key or clicking on the "HELP" icon/selection in the toolbar. Help windows shall be context sensitive so operators and system administrators can move from form to form without leaving the help window. The SMS shall come with complete on-line documentation on CD or the ability to offload the documentation to removable media.
    c. Operator Groups: A minimum of 32 operator groups, allowing specific system module privileges to be accessed with each module being granted specific views, edit and execute privileges.
    d. Operator Levels: System access shall require a valid operator name and password governing a specific operator's level of access to each menu item.
    e. The SMS shall allow a system operator to login over another system operator who is already logged into the same client workstation without the need to reboot the system. This process shall log the first system operator off alarm monitoring and log the new system operator on, changing any permission necessary for that system operator.

4. Logs, Status, Maintenance, Diagnostics:

    a. Historical Log: The system shall allow event history to be written to the hard disk in an archive format. At a minimum, the system shall support 500,000 transactions. Warning messages shall be generated at a user defined level of capacity. The system shall have the ability to offload the archive files to removable media automatically or manually.
    b. System Status: The system shall query the status of any or all of the system's access control points, inputs and outputs.

c. System Maintenance/Diagnostics: The system shall provide for remote diagnostic capabilities. In addition, online diagnostics and communications maintenance shall be able to be activated from the operator interface.

5. Administrator:

a. The SMS shall provide system administrators with the ability to segment their access control SMS field hardware devices into various zones or areas where alarm monitoring client workstations will monitor. These zones shall be assigned an alphanumeric name using up to a minimum of 64 characters.
b. The SMS shall allow other devices such as card readers, input and output modules and intelligent system controllers to be automatically part of the monitoring zone when an intelligent system controller is selected, and it shall allow the system administrator to define which devices such as card readers, etc. belong to that monitor zone.
c. Updating of monitor zones shall take place in real time and without requiring operators to re-login.

6. General:

a. Elevator control support for the number of floors and cabs shown on the drawings.
b. The SMS software shall be written to Microsoft's published standards for user interface design, secure coding practices and database implementation guidelines such as Microsoft Open Database Connectivity (ODBC) interface.
c. All tasks shall be accessible from any compatible client workstation on the network using one or all of the following:

1) Traditional client/server architecture.
2) N-Tier architecture where the SMS shall support the expansion of the system architecture and allow for end-user deployment. The SMS shall allow, but not require, the separation of the database, application server, web server and client interface. The system shall require that all connections to the database be performed through a trusted link from the client or internet browser interface.
3) Centralized publishing of applications using Windows Terminal Server and Citrix through any compatible internet browser application and/or by mobile computer including tablet PC.

d. The SMS shall use an open architecture where all data must reside on a single database and must be accessible in real time to every SMS workstation or web-based client connected to the network. The system database shall be used to create and maintain the cardholder database. A screen designer module shall allow the creation and editing of custom database tables and data entry screens.
e. The SMS shall be able to connect to and interface bi-directionally with external data sources using all of the following methods:

1) ASCII with support for XML-formatted text exchange of data activated both manually and automatically.
2) ASCII with support for XML-formatted text exchange of data using a direct table interface activated both manually and automatically.
3) Real time exchange of data via Active Directory/LDAP utilizing an API supported by the SMS manufacturer. The live exchange of data shall permit exposure of SMS events and transactions to other data sources in real time and allow for receipt of data into the SMS, permitting this data to be acted upon and trigger linked events in the SMS in real time.

f. Security: Access privileges within the application software shall be permitted by use of a password protection system. The cardholder database shall have the following password security levels.

1) A minimum of six (6) unique operator access levels
2) Ability to view only the database fields
3) Ability to restrict operator viewing to any of the individual database screens within a record
4) Ability to restrict operator viewing to any of the database partitions

g. Cardholder Configurations: The system shall have the capacity to support a minimum of 25,000 cardholder files. Each cardholder shall be capable of having up to five (5) access levels actively assigned to their account.
h. The system shall have cardholder identifications for "Visitor" and "Escort", with an associated optional validity period assignable with an activation and deactivation date.
i. The cardholder database screen shall have the following data associated with each cardholder:

1) Last edit by operator with edited date and time
2) Last date/time card was used
3) Last reader giving valid access
4) Last reader denying access
5) Anti-pass back status

j. The system shall provide advanced query capability with the following search criteria: equal to, not equal to, greater than, greater than or equal to, less than, less than or equal to, like, is empty, is not empty, is between, and, or, not.
k. Access Control Configuration: The configuration application shall be password protected, restricting what each individual may edit or display inside the configuration application.
l. Text descriptions of access points such as doors.

7. Time Zones:

a. The SMS shall be capable of creating and storing up to 255 time zones. Each time zone shall have a minimum of six (6) intervals. Each interval shall be assignable to any day of the week.

b. Each time zone shall be assignable to an alphanumeric name. Time zones shall be applied to access levels, card reader modes, alarm inputs, alarm outputs, and alarm masking and logging functions. Time zones shall be allowed to belong to any or all access levels so that the time zone only has to be defined once.

8. Access Levels:

   a. The SMS shall be capable of defining a minimum of 32,000 access levels with a minimum of 32 access levels per cardholder per database segment. Access levels shall consist of a combination of card readers and time zones.
   b. Each access level shall be assignable to an alphanumeric name.
   c. Card readers shall have the ability to be assigned to any or all access levels defined in the SMS. Individual card readers shall be capable of having a distinct time zone assigned to it.
   d. The SMS shall allow an 'Allow User Commands' option to be assigned on a per access level basis where keypad readers are in use.
   e. The SMS shall allow a 'First Card Unlock' option to be assigned on a per access level basis. First Card Unlock feature, when configured, retards a pre-determined time zone activated unlock command until a valid credential has been presented and granted access to the portal.

9. Temporary Access Levels:

   a. The SMS shall be capable of assigning temporary access levels inclusive of the 32,000 assignable access levels.
   b. Each temporary access level shall be assignable to an alphanumeric name.
   c. Each temporary access level shall be definable with a start and end date.
   d. Temporary access levels shall be stored in the ISC, and functionality shall be maintained in the event of disconnection with the ISC.

10. Access Groups:

    a. The SMS shall be capable of assigning access groups, with a maximum of 32 access levels per access group.
    b. Each access group shall be assignable to an alphanumeric name.

11. Precision Access Levels:

    a. The SMS shall be capable of assigning precision access levels in addition to the 32,000 access levels, with the ability to assign unlimited card reader and time zone combinations. Precision access levels provide capability of assigning a unique access level on a per card basis.
    b. Each precision access level shall be assignable to an alphanumeric name.

12. Holidays:

    a. The SMS shall provide a minimum of 255 holiday assignments using an embedded calendar. Holidays shall be assigned an alphanumeric name and shall be grouped into eight (8) types of holidays, and shall be assignable to individual time zones. Access rights, card reader modes, and alarm masking schedules must be able to be altered when the current date is designated as a holiday.
    b. Dates for Daylight Saving Time changes shall be definable and shall take effect automatically.
    c. The SMS shall support holiday ranges that allow a single holiday to span across multiple calendar days.

13. Database Segmentation:

    a. The SMS shall be required to support data segmentation whereby each segment shall have its own set of cardholders, field hardware, and system parameters (time zones, access levels, etc.). This segmentation shall expand the limitations of the SMS parameters (e.g., access levels and time zones) to the maximum capacity of each parameter multiplied by the number of segments. The following list shall be made available for segmentation:

        1) Access group
        2) Access levels
        3) Actions
        4) Action groups
        5) Alarm inputs
        6) Alarm mask groups
        7) Alarm outputs
        8) Areas
        9) Credential types
        10) Card formats
        11) Cardholders
        12) Card readers
        13) Central station receivers
        14) Device groups
        15) Digital video archive servers
        16) Fire alarm panels
        17) Guard tours
        18) Global I/O function lists
        19) Global I/O links
        20) Holidays
        21) Intercom panels
        22) Intercom stations
        23) Intrusion detection panels
        24) ISCs
        25) Maps
        26) Monitor zones
        27) Precision access groups
        28) Receiver accounts

29) System operators
30) Time zones
31) Tour groups
32) Visitors
33) User permission groups

b. This project will require that the database be segmented into 3 segments by the Contractor.

14. Field Hardware Communications:

a. The SMS shall support communications with the intelligent system controllers (ISCs) by the following protocols:

1) RS-232
2) RS-485
3) TCP/IP
4) Dial-up modem

b. Communication baud rate shall be system selectable with a range between 1,200- to 115,200 bits per second.
c. Download communication between the SMS and the ISC shall be fully multi-tasking and shall not interfere with operational functions.
d. Upon loss of communications between the SMS server and the ISC, an alarm shall be created with a time stamp. Upon re-established communication, the SMS and the ISC shall automatically re-synchronize from the point of communication loss without operator intervention.

15. Dual Path Field Hardware Communication:

a. The SMS shall support dual path communications between the SMS server and the ISCs. This shall allow for a redundant communication path in the event the primary path fails. The secondary path shall support all primary path protocols.
b. In the event of a communication failure of the primary path, the ISC shall initiate a switchover to the secondary path. During this fail switchover period, the ISC shall periodically check to see if the primary path has been re-established and will automatically switch back upon a successful connection. Alarms shall be generated upon loss or restoration of communications.

16. Intelligent System Controller Remote Support:

a. The SMS shall support remote operations to and from the intelligent system controller (ISC). The remote connection shall be either a constant connection or a scheduled connection. If the connection is constant, then every panel shall have its own connection at the host. If the connection is scheduled, then all panels using remote connections shall have the ability to share the same host connection(s).

b. System administrators shall have the ability to define the remote connections available in the pool. For each connection, system administrators shall be able to define the connection type and the client workstation to which it is installed.
c. Remote sessions shall occur under any of the user defined scenarios:

1) On Demand Connection: A system operator shall have the ability to automatically initiate a remote session to an ISC via the alarm monitoring module.
2) Scheduled Connection: System administrators shall have the ability to configure the SMS so that the ISC remotes into the SMS at pre-determined times through use of time zones.
3) Critical Alarm Activated: System administrators shall have the ability to configure the SMS so that the ISC initiates a remote session with the SMS when a critical alarm is activated in the field.
4) Buffer Threshold: System administrators shall have the ability to configure the SMS so that the ISC initiates a remote session with the SMS when a pre-determined number of events are stored in the ISC memory buffer.

17. Area Control:

a. Area control shall be a security method of preventing a person from passing their credential to another person for dual entry into a single location using one card. The SMS shall support the following area control features.
b. Global Hard Anti-Pass Back:

1) The Global Hard Anti-Pass Back feature shall require that a credential always be used to enter and exit an area. The controlled areas shall have both entry and exit card readers at all portals. Entry and exit readers shall be able to span across multiple ISCs. Areas shall be logically defined under the SMS, and area control shall not be required at all areas. Global Hard Anti-Pass Back shall work in the following manner:

a) A cardholder must present his/her credential at the entry card reader of the area that the person wishes to enter. Once access has been granted into the area, the cardholder cannot present the credential to another entry card reader within the same area without first presenting his/her credential to the respective exit card reader of that area. Should a cardholder attempt to use any other card reader in the same area besides the occupied area's exit card reader once access has been granted to that area, the cardholder shall be denied access and an alarm shall be reported to the alarm monitoring client workstation. Nested control areas (areas inside areas) shall be definable with a minimum of 64 entry and exit card readers. It shall be possible to have an area within an area and/or multiple areas that are independent of each other in which Global Hard Anti-Pass Back rules shall apply.

c. Global Soft Anti-Pass Back:

1) The Global Soft Anti-Pass Back feature shall require that a credential be used to enter and exit an area. The controlled areas shall have both entry and exit card readers at all portals. Entry and exit readers shall be able to span across multiple ISCs. Areas shall be logically defined under the SMS, and area control shall not be required at all areas. Global Soft Anti-Pass Back shall work in the following manner:

a) A cardholder must present his/her credential at the entry card reader of the area that the person wishes to enter. Once access has been granted into the area, the cardholder cannot present the credential to another entry card reader within the same area without first presenting his/her credential to the respective exit card reader of that area. Should a cardholder attempt to use any other card reader in the same area besides the occupied area's exit card reader once access has been granted to that area, the cardholder shall be allowed access (if that cardholder has the appropriate access level to access the new area), and an alarm shall be reported to the alarm monitoring client workstation. It shall be possible to have an area within an area and/or multiple areas that are independent of each other.

d. The following summary criteria shall apply under Global Hard or Soft Anti-Pass Back:

1) Initially all card holders are reset to Area 0.
2) Any cardholder shall enter a controlled area any time after Time 0 by presenting a credential to a SMS entry card reader.
3) A cardholder shall not exit the controlled area unless he/she has entered the area presenting a credential to the SMS entry card reader.
4) A cardholder shall not enter the controlled area a second time unless the cardholder has exited that area previously.
5) A cardholder shall be able to enter through any entry card reader and exit through any exit card reader of a single controlled area.
6) These options shall include a "forgiveness" feature that will allow the system administrator to reactively reset the anti-pass back of all cardholders to Area 0, either through a manual override or a time zone command.
7) The SMS shall provide an anti-pass back exempt option for privileged or VIP cardholders. Cardholders with this option will not have anti-pass back rules applied to them.
8) The SMS shall also have a "forgiveness" feature that will allow the system administrator to proactively assign an automatic reset to an individual cardholder. This shall allow the system administrator to reset the anti-pass back of an individual cardholder to Area 0 automatically for a defined number of times.

e. Timed Anti-Pass Back:

1) Timed Anti-Pass Back shall allow the system administrator to decide how long after a cardholder has presented their credential that they will have to wait before the same credential will be accepted again at the same card reader. This helps prevent multiple swipes by an individual to allow access to others through turnstile doors.

f. Two-Person Control:

1) Two-Person Rule shall be provided to restrict access to certain areas unless there are two (2) cardholders present. This restricts individuals from being alone in restricted or highly secure areas. When an area is configured for Two-Person Rule, the following criteria shall prevail:

a) The card reader shall grant access only if two valid cardholders (with authorized access levels) swipe their credentials one after the other. In the event a second authorized card is not presented within 10 seconds of the first authorized credential, the card reader shall reset and the first card will have to be swiped again.
b) Once two people occupy an area, individual access shall be granted.
c) Individual exit shall be permitted until an area is occupied by only two cardholders, at which point the Two-Person Rule applies for exit.

g. Occupancy Limit:

1) Occupancy Limit shall restrict the number of cardholders that shall be present in an area at any given time. The Occupancy Limit area shall be able to be defined by the system administrator up to the limits of the cardholder capacity of the system. Once the occupancy limit has been reached, a cardholder must swipe out of the exit card reader before the next cardholder may enter. Each area for which Occupancy Limit is enabled shall be definable with up to 64 entry/exit card readers. Multiple Occupancy Limit areas shall be definable.

h. Mustering:

1) The SMS shall support Mustering functionality. The Mustering function shall provide an automatic capability for registering cardholders that are on site during an incident. Designated exit and entry card readers shall be used to enter and leave hazardous locations and safe locations. When an incident occurs, a muster report shall be generated that consists of a listing of all personnel that are within the hazardous locations, as well as all personnel that have registered in a safe location.

i. Alarm Masking Groups:

1) The SMS shall support a group alarm masking feature whereby system administrators shall be able to create groups of alarm inputs that enable them to mask or unmask multiple input control module inputs and card reader inputs simultaneously.
2) The following events shall have the ability to be part of an alarm masking group:

a) Input Control Module Events
b) Alarm Input Active
c) Card Reader Events
d) Auxiliary Input Active
e) Denied Count Exceeded
f) Door Contact Tamper
g) Door Forced Open
h) Door Held Open
i) Card Reader Input Tamper

3) Alarm Masking Groups shall be able to be masked as a group or as individual points.
4) Alarm Masking Groups must support the ability to be masked multiple times. Alarm Masking Groups shall be able to be masked and/or unmasked via alarm monitoring commands by guards, via card reader keypad function keys, or via global linkage commands.
5) The SMS shall support "2-man control" for masking Alarm Masking Groups.
6) The SMS shall support an Alarm Masking Group status change (masked to unmasked or unmasked to masked) action to be linked to a function list that is capable of performing many system actions, such as activating a relay output. The SMS shall support a minimum of 64 Alarm Masking Groups per intelligent system controller. with a minimum of 200 alarm inputs per Alarm Masking Group.

j. Cardholder Escort Control:

1) The SMS shall support comprehensive escort functionality based upon access levels. Access levels shall include options for "Escort Required", "Designated Escort", "Not an Escort" and "Does not require an Escort." Contractor shall integrate escort level and designation into badge design in cooperation with Owner.
2) The escort feature shall be capable of one-to-one and one-to-many Escort to Escorted functionality.

k. Cardholder Use Limits:

1) The SMS shall support a Cardholder Use Limit feature that shall allow system administrators to specify the maximum number of times that a cardholder may use their credential at card readers in the SMS.

l. Extended Individual Strike Times:

1) The SMS shall support Extended Individual Strike Times that allows a card reader's strike to be active for an extended period of time beyond the pre-determined standard strike time on a per cardholder basis. The extended strike time shall be user definable up to 255 seconds. Extended strike times shall be set on a card reader by card reader basis.

m. Extended Individual Door Held Open Times:

1) The SMS shall support Extended Individual Door Held Open Times that allow a card reader's door to be held open for an extended period of time beyond the pre-determined standard held open time on a per cardholder basis. The extended held open time shall be user definable up to eight (8) hours. Extended held open times shall be set on a card reader by card reader basis.

n. Extended, On Demand, Door Held Open Times:

1) The SMS shall support Extended, On Demand, Door Held Times via a command keypad located in the field. The Extended Held Open command configuration shall consist of a command key sequence that shall be from three to six keys used to enter the number of minutes to extend the door held open time (up to 999 minutes) and a pre-alarm time (from 0 to 30 minutes).
2) Only those cardholders having command authority at a given card reader configured for 'Allow User Commands' shall have the ability to execute the Extended Held Open command at that card reader. The Extended Held Open command shall be available after a valid cardholder has received an access grant at the card reader. The cardholder shall have a period of 15 seconds after the access grant to enter the extended held open command sequence.

o. Graphical System Overview Tree:

1) A Graphical System Overview Tree shall display a graphical representation of all field hardware including hardware from other systems which are interfaced. System administrators shall be able to modify a device that is depicted on the Graphical System Overview Tree or see its properties by double clicking on the icon, and the SMS shall bring them to the appropriate form.

p. Pre-Alarm:

1) The SMS shall support a Pre-Alarm feature at the card reader. The pre-alarm will sound a tone at the card reader prior to the door held open alarm. The pre-alarm setting shall be configurable for up the maximum allowable door hold open time.

q. Alarm/Event Logging:

1) All alarms and events in the SMS shall, by default, always be recorded in the database. The SMS shall give system administrators the ability to select, on a time-zone basis, the times that they require the SMS to log specific events to the database.
2) System administrators shall have the option for particular alarm/events to be set to log or not to log on any individual reader and/or input.

r. Scheduling Utility:

1) The SMS shall provide an integral Scheduling Utility. The Scheduling Utility shall allow system administrators to schedule actions to occur on a one-time or a recurring basis. Recurring schedules shall be configured to begin immediately, last indefinitely, or have optional start and end dates.
2) The Scheduling Utility shall be available from both the system administration and alarm monitoring modules.

a) The types of actions that shall be schedulable include, but are not limited to:
b) Action Group
c) Event Archiving/Purging
d) Arm/Disarm Area
e) Start of Guard Tour
f) Execution of Scripts
g) Activate, Deactivate, Pulse Device Output and Device Output Groups
h) Global Anti-Pass back Reset
i) Download Firmware to equipment.
j) Download Database to ISCs
k) Execute Function List
l) Mask/Unmask Inputs, Input Groups, Alarm Mask Groups, Door Forced Open or Held Open
m) Open Door, Open Door Group
n) Change Reader Mode
o) Automatic Reports
p) Reset Use Limit
q) Move Bulk Credentials from an Area
r) Deactivate Credentials
s) Logout Visitors
t) Schedule PTZ Presets

3) The Scheduling Utility shall maintain a history log in the database for actions that it executes.

18. Multiple Card Formats:

a. Each ISC shall support a minimum of eight (8) access control card formats and, if applicable, eight (8) asset formats.

19. Card Reader Cipher Mode:

    a. The SMS shall support a Card Reader Cipher Mode that shall allow authorized cardholders to enter their credential ID by typing it into a card reader keypad, thus emulating the presentation of the credential to the card reader.

20. Denied Access Attempts Counter:

    a. The SMS shall support a Denied Access Attempts Count on a per card reader basis. The "Denied Attempts Count" value shall be configurable from 0 to 255. The following access denial types shall cause the current denied count to be incremented:

        1) Unknown PIN entry at a card reader configured as 'PIN or Card' mode.
        2) Invalid cipher entry at a card reader in Cipher Mode.
        3) Invalid PIN entered for a given card at a card reader configured as 'Card and PIN' mode.
        4) Non-matching biometric presented for a given card at a card reader in Biometric Verify mode.

21. Card Reader Time Zone Overrides:

    a. The SMS shall allow for the pre-defined default card reader settings to be overridden or temporarily changed on a time-zone basis. At the beginning of the selected time zone, the selected card reader's operational mode shall be modified from its default mode to any one of the following modes: Locked, Unlocked, Facility Code, Card Only, Card or PIN, Card and PIN, Card and Biometric, Card or PIN and Biometric, and/or Card and PIN and Biometric. The aforementioned options shall be available depending on the type of card reader used.
    b. Each card reader shall have the ability to have multiple time zone setting overrides assigned to them as required by the system administrator.

22. Alarm/Event Routing:

    a. The SMS shall be capable of allowing system administrators to route alarms and events to various alarm monitoring client workstations on the network. The SMS shall allow any alarm or event to be routed to one or multiple client workstations on the network regardless of where the alarm is generated in the field. Alarms shall be routed to client workstations on a device-by-device level.
    b. The SMS shall be capable of automatic re-routing of an alarm from workstation X to workstation Y if the alarm is not responded to within a user definable time period.

c. The SMS shall implement network synchronization such that in the event that an alarm is routed to multiple client workstations, once the first client workstation acknowledges the alarm, the alarm shall be cleared from all other client workstations. As such, alarms that are routed to an Alarm Monitoring client workstation that does not have a System Operator logged in shall be queued so that all unacknowledged alarms will report to that client workstation once a System Operator has logged into the SMS. Alarms/Events shall be routed based on default settings or time zone control.

23. Text Instructions:

    a. The SMS shall allow for a set of text instructions to be associated with each alarm that arrives into the SMS. The text instruction function shall allow the system administrator to enter a minimum of 32,000 characters of text for procedures to follow for each alarm that arrives at the alarm monitoring client workstations. Each alarm or event in the SMS shall have its own unique set of text instructions.

24. Customizable Voice Instructions:

    a. The SMS shall allow for a customizable voice instruction to be associated with SMS alarms. The customizable voice instruction feature shall allow the system administrator to record a voice instruction of unlimited length.

25. Alarm Attributes:

    a. The system administrator shall have the ability to configure how the SMS handles the annunciation of alarms on an individual basis. Each alarm and/or event shall have the option(s) to:

        1) Display at one or more alarm monitoring client workstation.
        2) Allow higher priority alarms to be displayed on the alarm monitoring client workstation ahead of lower priority alarms.
        3) Require the field device that generated the alarm to be restored to its normal state before the alarm is cleared.
        4) Print the alarm to the local event printer.
        5) Have a customized voice message annunciate at the client workstation.
        6) Have the alarm breakthrough to the alarm monitoring window should the system operator be working in another application
        7) Allow system operators to change the journal entry once the alarm has been acknowledged.
        8) Ensure that the alarm will not be able to be deleted from the alarm monitoring window upon acknowledgment.
        9) Display text and audio instructions outlining the procedures to follow when responding to the alarm.
        10) Automatically call-up associated maps.
        11) Automatically call up the associated cardholder record.
        12) Automatically call up the associated cardholder photo using the video verification function.

13) Require a password to view the alarm.
14) Require a password to acknowledge the alarm.
15) Require acknowledgment to clear.
16) Allow mandatory journal entry upon acknowledgment.
17) Use pre-defined journal entries for alarms.
18) Select the option for journal entry based upon the specific alarm.
19) Send surveillance interface commands to the surveillance system.
20) Automatically send an e-mail message.
21) Automatically send an alphanumeric page.
22) Have the alarm appear on the alarm monitoring window with a flashing colored coded bar across the alarm for high priority alarms.
23) Have the alarm, when acknowledged, display an alternative flashing color coded bar across the alarm than for the original alarm color.
24) Trigger a function list(s) when the alarm is acknowledged.
25) Require user logon for acknowledgment.
26) Have the ability to mark an alarm as "In Progress" where the system shall silence any repeating audio notifications on the workstation where the alarm was routed, and remove the alarm sprite notification on the graphical map. Additional operators' monitoring alarms shall be notified that the alarm has been marked "In Progress".

26. Alarm-Event Mappings:

    a. The SMS attributes in Alarm Attributes shall be assignable on a 'global' basis to all devices that share an alarm description. Thus, the 'Door Forced Open' alarm attributes shall apply to any door with a card reader that is forced open in the SMS. The SMS shall have the capability to assign a unique group of alarm attributes to specific device/alarm combinations to override the global settings for specific case settings. Each device/alarm combination shall have the ability to have its own unique attribute set if the system administrator desires.

27. System Downloads:

    a. The SMS shall provide for the downloading of data to the ISCs. Downloads shall load SMS information such as time zones, access levels, alarm configurations, cardholder information and card reader configurations.
    b. All ISCs on the SMS shall be capable of either full or selective downloads to individual intelligent system controllers, and bi-directionally so that alarms will still report to their respective alarm monitoring client workstations as cardholder information is being downloaded.
    c. Information on cardholder status, credential status, time zones or access levels shall download in real time as they are added, modified, or deleted from the SMS.

28. Portal Configuration Options:

    a. The SMS shall include the following options for each portal on the system:

        1) Allow user commands such as manual door unlock
        2) Rename auxiliary inputs

3) Rename auxiliary outputs
4) Independently supervise REX and DPS
5) Configure REX and DPS as Normally Open or Normally Closed
6) Deny if duress
7) Assume door used
8) Alarm masking
9) Activate outputs
10) Two card control
11) Checkpoint
12) Do not activate strike on REX
13) The ability to allow system administrators to determine on a time-zone basis to log or not to log on a card reader by card reader basis
14) Access grants
15) Access denied
16) Card reader status alarms
17) The SMS shall allow for user definable door strike functionality for each card reader in the SMS
18) The SMS shall allow for each card reader to be selected as either an 'In' reader, 'Out' reader, or 'None' to allow for ease of reporting time and attendance basic 'Time In' and 'Time Out' data.
19) Enforce Use Limit: This option shall enable card use limits at the card reader. limiting the number of times that cardholders may use their credential to gain access at the card reader
20) Supervise Door: Sets the SMS so that the card reader door contact is wired as a supervised input

29. The SMS shall allow for one or more access points in a specified area to be armed and disarmed directly from a control keypad.
30. Real-Time, Live Video User Verification:

    a. The SMS shall have the capability of interfacing to a surveillance system and displaying a live video image next to a stored cardholder image record. This feature shall be system configurable.

31. Traces:

    a. The SMS shall allow for a live or historical trace on any ISC, ICM, alarm input, credential (cardholder), intrusion detection device, monitor zone, or card reader. If applicable, the SMS shall allow for a trace on any asset, intercom, or camera. Multiple traces may be run simultaneously. The SMS shall allow system operators to filter alarm types from the history trace window. Alarms that shall be filtered from the trace window are access granted alarms, access denied alarms, system alarms, duress alarms, and area control alarms.
    b. Destination Assurance: The system shall provide the ability to alert the system operator when a cardholder does not reach a required location and present their credential after entering at a designated checkpoint in a designated period of time.

32. Real-Time, Dynamic Graphical Maps:

    a. The SMS shall support graphical maps that display device and group status, function lists dynamically in real time. The maps may be configured to appear on command or when specified alarms are selected for acknowledgment. Map device icons shall have the ability to dynamically change shape and/or color to reflect the current state of the device.
    b. The SMS shall support all map formats listed below:

        1) Adobe Photoshop (.psd)
        2) AutoCAD DXF (.dxf)
        3) Encapsulated Post Script (.eps)
        4) JPEG (.jpg)
        5) TIFF (.tif)
        6) Windows Metafile (.wmf, .emf)
        7) Windows Bitmap (.bmp, .dib)

    c. The SMS shall support map hierarchies or maps within maps. There shall be no limit to the number of maps that shall be nested hierarchically with each other. Multiple maps may be displayed simultaneously.
    d. The SMS shall support user defined icons for field hardware devices. The SMS shall also give system operators the ability to affect the mode of card readers, open doors, start a trace on a device, mask/unmask alarm inputs, and activate/deactivate/pulse an output from the map icons.
    e. The graphical maps shall have the ability to be printed to a local printer.

2.6 ACCESS CONTROL GRAPHICAL USER INTERFACE (GUI)

A. A workstation based custom GUI shall be provided for complete display of real time system activity.

B. The GUI shall provide the following features:

1. Display in real-time, the status of devices by dynamically changing shape or color to indicate status.
2. Acknowledge alarm conditions.
3. Perform manual operations on all monitor and control points.
4. Perform graphic editing functions.
5. Customization of icons color or shape based on status.

C. Graphical representations shall be made of the following activity:

1. Cardholder Activity: Access granted (including duress), access denied, lost card used, stolen card used, inactive card used, unescorted visitor.
2. Input Point Activity: Input condition (normal, abnormal, cut, short, shunt, unshunt).
3. Output Point Activity: On status (automatic, by operator, by link), off status (automatic, by operator, by link), access level on, access level off.
4. Door Activity: Auto unlock, auto lock, closed, opened, forced open, left open, door switch cut, door switch shorted, REX status (cut, shorted, normal, abnormal), input unlock, operator lock, operator unlock.

5. Controller Activity: Controller on-line, controller off-line, controller communications normal, communications cut.
6. System Activity: System error, workstation start, workstation stop, printer off-line, printer unavailable, printer overflow, unknown card.
7. Regional Group Activity: Occupancy restriction (high limit, low limit), anti-pass back (entry, exit), policy violation, escort left, number of escorts, numbers of users, number of visitors.

D. The GUI shall have the ability to display a minimum of 25 custom graphical screens, developed by the SMS vendor with electronic maps provided by Owner.

E. The system shall have the ability to automatically call up specific maps. Each input point shall be linked to a primary map.

F. Graphical editing software shall be included, allowing the Owner to create and edit the graphical screens.

G. Graphics screens shall be developed using a minimum of eight (8) colors from a palette of 64 available.

H. The system shall operate on a Windows workstation as provided and recommended by the SMS vendor.

2.7 CREDENTIALS AND BADGING

A. Badging Station:

1. Provisioning:

a. **The workstation(s) shall be furnished by the Contractor and shall meet the specifications defined by the SMS software manufacturer to meet or exceed the functionality and performance specifications of the system and integrations defined in this and related sections. Contractor shall coordinate with Owner for possible requirements to utilize a specific manufacturer. Contractor-furnished workstation(s) shall have a three (3) year limited warranty.**

2. Software:

a. General:

1) The SMS shall support a credential design module that is integral to the SMS source code with the ability to create and maintain credential designs. Features shall include the ability to support:

a) Complete credential design and layout tools
b) Chroma key
c) Image import
d) Ghosting
e) Signature capture
f) Barcodes
g) Smart chip support

b. Licensing

1) Required badging/credential management licensing shall be furnished.

3. Hardware:

a. Desktop configuration.
b. Pentium 4 Dual Core CPU, 2.5 GHz or greater
c. 4 GB RAM
d. 100 GB hard drive, 7200 RPM
e. Four (4) USB 2.0 ports, 10/100/1000 network interface card
f. One (1) 19" flat screen LCD monitor
g. Dedicated 256 MB SVGA accelerated video card
h. Internal DVD +/- RW ROM drive
i. Printer:

1) Printer Manufacturer shall be:

a) Fargo DTC1000
b) Magicard Enduro +

2) The SMS shall support a printer with industry standard and Microsoft certified drivers. The printer shall support:

a) Double sided printing at a resolution of no less than 300 dpi, full color on the front, monochrome on the back
b) Edge to edge printing
c) High speed printing per card of a minimum of 7 seconds for monochrome and 35 seconds for YMCKO
d) Holographic overlay
e) Inline magnetic stripe encoding
f) Inline Contactless Smart card encoding
g) An input feeder/hopper with a minimum capacity of 100 cards and an output stacker/hopper with a minimum capacity of 30 cards

j. Images:

1) Camera:

a) The badging station shall be compatible with flash lighting and USB connected cameras, allowing the capture of a cardholder image at a minimum resolution of 3 mega pixels.
b) SMS image capture, storage, and hardware compression techniques must be in compliance with the ANSI standard or JPEG (Joint Photographic Experts Group).

c) The SMS shall provide the ability to capture a cardholder's image through the use of any industry standard scanner or digital camera that utilizes a TWAIN interface. Images shall be able to be scanned at up to 16.7 million colors for a true color scanned image. When using a digital camera that supports multiple resolutions, the system shall allow the operator to select the desired resolution.

d) Include required USB interface box, camera, camera power supply, integral or external integrated flash, tripod and 4' x 4' wall mounted white backdrop.

2) Image Import:

a) The SMS shall allow system operators to have the ability to import a cardholder's image at the time of enrollment. The SMS shall support importing image formats of Bitmap (.bmp, .dib), JPEG (.jpg), JFIF (.jif), Adobe Photoshop (.psd), Macintosh PICT (.pct), Portable Network Graphics (.png), TIFF (.tif), Windows Metafile (.wmf, .emf).

4. Badge Design:

a. Provide training and work in conjunction with Owner for development of four (4) badge designs.

5. Supplies:

a. Print Ribbons:

1) YMCKOK ribbons shall be provided to print 200 hundred (200) badges, plus one spare ribbon of the same type and capacity.

b. Cleaning Kits:

1) One cleaning kit shall be provided for every ribbon provided.

c. Lanyards and Sleeves:

1) Lanyards and badge sleeves shall be furnished by Owner.

d. Badge Quantities:

1) Badge quantities and types shall be as defined below.

B. Credentials:

1. Contactless Smart Cards: 13.56 MHz radio frequency identification electronics, passive design. Card shall meet ISO 15693 and ISO 14443B2 standards.

a. Maximum Dimensions: CR 79: 3.313" x 2.063" x 0.04", CR 80: 3.375" x 2.125" x 0.04".
b. Construction to be of PVC or polyester laminate.

c. Each card shall contain a unique serial number.
d. Cards shall contain options for various memory capacities of 2k, 16k or 32k with a fixed number of application areas or areas which are sized by dynamic allocation.
e. Each application area shall contain a unique authentication key. The card and reader shall require matching keys in order to function together. All RF communication between card and reader shall be encrypted using a secure algorithm.
f. The card shall be protected with DES or 3DES encryption algorithms.
g. The cards shall be provided with custom keys uniquely matched to individual sites/customers to allow a non-interchangeable, high level of security through the use of formatting programs such as HID iClass Elite or Corporate 1000.
h. Cards shall be encoded with bit lengths that are compatible with all other components of the SMS.
i. Application areas shall be reserved for future applications as Owner requires.
j. Cards shall support programming and updating of custom applications after issue.
k. Cards shall be capable of having a photo and/or other graphical images printed directly on the surface of the card.
l. Provide optional slot punch-outs on the short and long edge of the card.
m. Provide Contactless Smart cards. Cards shall be individually numbered with sequential matching of internal and external numbers.
n. Cards shall be provided with a lifetime warranty.

2. Proximity Cards: 125 kHz radio frequency identification electronics, passive design, in a thin durable credit card sized package. Card read range shall not be affected by body shielding or environmental conditions.

a. Maximum Dimensions: CR 79: 3.313" x 2.063" x 0.04", CR 80: 3.375" x 2.125" x 0.04".
b. Construction to be of PVC or polyester laminate.
c. Each card shall contain a unique serial number.
d. The cards shall be provided with custom keys uniquely matched to individual sites/customers to allow a non-interchangeable, high level of security through the use of formatting programs such as HID Corporate 1000.
e. Cards shall be encoded with bit lengths that are compatible with all other components of the SMS.
f. Cards shall be capable of having a photo and/or other graphical images printed directly on the surface of the card.
g. Provide optional slot punch-outs on the short and long edge of the card.
h. Provide 200 Contactless Smart cards. Contactless Smart cards shall be individually numbered with sequential matching of internal and external numbers.
i. Proximity cards shall have a two-year replacement warranty; 15 months for the magnetic stripe.

3. Contactless Smart Fobs: 13.56 MHz radio frequency identification, passive design.

4. Contactless Smart Fobs: 125 kHz radio frequency identification, passive design.
5. Adhesive Tags: 13.56 MHz radio frequency identification, passive design
6. Adhesive Tags: 125 kHz radio frequency identification, passive design.

    a. Fobs:

        1) Maximum Dimensions: 2" x 1.25" x 0.4". Constructed of molded and ultrasonically sealed polycarbonate body. The molded body shall contain a hole for attachment to a keychain.
        2) Supports attachment to keychain.
        3) Meets ISO 15693 and 14443B2 standards.
        4) Read range shall not be affected by body shielding or environmental conditions.

    b. Adhesive Disk:

        1) Maximum Dimensions: 1.4" diameter

    c. Each credential shall contain a unique serial number.
    d. Credential shall contain at least three memory capacities from 2k, 4k, 8k, 16k or 32k with associated allocation areas.
    e. Each application area shall contain a unique authentication key. The credential and reader shall require matching keys in order to function together. All RF communication between the credential and reader shall be encrypted using a secure algorithm.
    f. Credential shall be protected with DES or 3DES encryption algorithms.
    g. The credentials shall be provided with custom keys uniquely matched to individual sites/customers to allow a non-interchangeable, high level of security through the use of HID iClass Elite formatting program.
    h. The credential shall support programming and updating of custom applications after issue.
    i. The credential shall be marked with an external ID number, either in inkjet or laser-etched numbering that matches the internal programmed ID number. If the external number does not match the internal number, a cross-reference chart shall be provided to the Owner.
    j. Credential shall be provided with a lifetime warranty.

C. Credential Management:

1. The SMS shall support a Credential Management and Enrollment module that is integral to the SMS source code with the ability to create and maintain the cardholder database. Features shall include the ability to:

    a. Add, modify and delete records based upon permissions
    b. Capture photo images, biometric information and signatures
    c. Print credentials
    d. Boolean search on any single or multiple fields
    e. Customization of screen layout and field names
    f. Advanced customization of fields, field names and screen tabs (pages) with optional Forms Designing and Editing module
    g. Determine single or multiple active credentials

h. Assign access levels and access groups
i. Bulk assignment/modification/deletion of access levels
j. Bulk deletion of cardholder records.
k. Native support for U.S. Government CHUID Standard
l. Limit the number of times the credential can be printed
m. Limit the access for searching the database based upon user defined criteria
n. Mobile badging operations.

2. The SMS shall support the following bar codes:

a. Code 3 of 9 (3:1)
b. Code 93
c. UPCA
d. EAN 13
e. EAN 8
f. Code 128 A
g. Code 128 B
h. Code 128 C
i. Codabar
j. PostNEt (Zip + 4 Postal)
k. Code 3 of 9 (2:1)
l. Interleaved 2 of 5 (2:1)
m. PDF-417 (2D)
n. Code 128 Auto
o. UCC-128
p. MSI Plessey
q. Extended Code 3 of 9
r. Extended Code 93
s. 2D Aztec

2.8 PORTAL DEVICES

A. Credential Readers:

1. Manufacturers:

a. HID Multiclass SE
b. Ingersoll Rand aptiQ Multi-Technology

2. Multi-Technology:

a. Compatible with 125 kHz proximity, 13.56 MHz Contactless Smart card, MIFARE, DESFire EV1.
b. Backwards compatibility with legacy 13.56 MHz Contactless Smart cards and 125 kHz proximity access control formats, including 26, 32, 35, 37 bit as well as HID Corporate 1000 format.

3. Card readers manufactured specifically for non-access control applications shall not be acceptable.
4. FIPS 201 compliant.

5. Provide compatibility with most access control systems by providing card data outputs in Wiegand and Clock/Data.
6. Allow the firmware to be updated in the field without the need to remove the reader from the wall.
7. Secure mounting methods using tamper resistant screws.
8. An audio beeper that provides various tones to signify access granted, access denied, power up and diagnostics.
9. Tri-color LED or three (3) LEDs for visual notification of various conditions.
10. ISO1443A, 1443B and 15693 compliant.
11. The ability to transmit an alarm from an integrated tamper switch.
12. Support dual authentication of identity through the combined use of access badge and personal identification number (PIN) on an integrated 12 key keypad.
13. PBT polymer or UL94 polycarbonate.
14. Read Range:

    a. Using 125 kHz cards or 13.56 MHz Contactless Smart cards, minimum operational read range shall not be less than one (1) inch after the readers have been installed in their permanent locations.

15. Operational voltage of 5-16 VDC, with operating temperature range of -31° F to 150° F and rated for outdoor use with a minimum rating of IP55.
16. Readers and credentials shall be compatible with each other and shall be from the same manufacturer.
17. Available in sizes to be mounted to a standard single gang box or to a mullion. Maximum sizes:

    a. Single gang box mount, with or without keypad: 5.1" x 3.1" x 1.1"
    b. Mullion mount: 6.0" x 1.9" x 0.9"

18. Lifetime warranty against defects in material and workmanship.

B. Request-To-Exit Motion Detector:

1. Manufacturers:

    a. Bosch DS 160 Series
    b. Pre-approved equal

2. Door monitor with sounder alert. Sounder alert shall have adjustable volume.
3. Adjustable latch time.
4. Selectable fail safe/fail secure.
5. Activation LED.
6. 12 or 24 VDC operation.
7. Sequential logic input.
8. Two (2) Form C contacts.
9. Tamper switch.
10. Field of view masking.

C. Request-To-Exit Button:

1. Manufacturers:

   a. Dynalock 6290 Series
   b. Seco-Larm SD7213 Series
   c. RCI 991 Series
   d. Pre-approved equal

2. 0-60 second adjustable pneumatic action.
3. Contacts shall be one of the following:

   a. DPDT
   b. SPDT double break with isolated common
   c. DPST
   d. Normally closed SPST with normally open SPST

4. One and one-half inches (1-1/2") to two inches (2") red mushroom button.
5. Stainless steel or aluminum plate labeled "EXIT" or "PUSH TO EXIT".
6. Available in mullion mount.

D. Door Position Switch:

1. Manufacturers:

   a. GE
   b. GRI
   c. Honeywell
   d. Pre-approved equal

2. Interior or Perimeter Door:

   a. One (1) inch or 0.75 (3/4) inch diameter, recessed
   b. DPDT contacts
   c. 0.75" to 1.25" (3/4" to 1-1/4") gap for wood door
   d. Maximum 0.375" to 0.625" (3/8" to 5/8") gap for steel door
   e. Basis of Design: UTC/GE/Sentrol 1076D

3. Overhead Door:

   a. Three (3) inch gap
   b. SPDT contacts
   c. 18" stainless steel armored cable
   d. Aluminum construction
   e. Basis of Design: UTC/GE/Sentrol 2207AU

4. Steel Door:

   a. A rare earth magnet shall be used.

E. Duress Buttons:

1. Manufacturers:

a. Honeywell (Hardwired) 269R, 270R
b. United Security Products (Hardwired) HUB Series
c. Honeywell (Wireless) 5800 Series
d. Pre-approved equal

2. Multi technology:

a. Hardwired:

1) DPDT contacts
2) Silent operation
3) Recessed activation button to prevent accidental activation.
4) Screw terminal connections
5) Key switch resettable
6) Momentary contacts

F. Cable:

1. Composite cable is allowed, although sufficient conductors may not be available in composite cables for all portal configurations. Contractor shall be responsible for additional required cables beyond one composite cable to each portal to meet functional requirements of the system.

a. Reader: 22 AWG, 3 pair, stranded, overall shield. Shield shall be grounded at control panel end only.
b. Request to Exit Motion Detector: 22 AWG, 4 conductor, stranded.
c. Door Position Switch: 22 AWG, 2 conductor, stranded.
d. Request to Exit Button: 18 AWG, 4 conductor, stranded.
e. Lock: Minimum 18 AWG, 4 conductor, stranded.

1) Lock may require heavier gauge cable depending on door hardware solution power requirements. Contractor shall coordinate with door hardware provider for higher current devices and shall adjust the gauge of the lock cable accordingly.

f. Auxiliary Devices: Refer to plans for requirements.

G. Locks and Door Hardware:

1. Electric/electronic locks shall be furnished and installed by the door hardware provider.
2. Access Control Contractor shall interface with and terminate cables to locks.
3. Access Control Contractor shall coordinate with door hardware provider for specified sequences of operation at the various portals.
4. Electrified cylindrical and electrified mortise locks shall have an integrated request-to-exit device.

5. Electric strikes shall have an integrated latch bolt monitor, and the dead latch shall be seated properly so that the strike cannot be defeated by manipulation.
6. Magnetic locks shall have a magnetic bond sensor.
7. Refer to architectural specifications and/or the architectural door schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with the manufacturer's instructions and recommendations for installation of all products.

B. Provide all system wiring between all components as shown on the project drawings or as directed by the manufacturer, whichever is the more stringent requirement.

C. Network controllers shall be installed centralized in the nearest telecommunications room(s). Mount controllers to the structural walls in a location coordinated with other utilities. Coordinate exact location with Architect/Engineer prior to installation. Provide dedicated +120 VAC emergency power circuit to the controllers using #12 AWG wiring from the nearest emergency electrical power distribution panel board.

D. Provide wiring and connection to all electrified locking hardware devices. Complete programming and testing of all electrified locking hardware devices.

E. Install all credential readers in accordance with manufacturer's instructions where shown on floor plans, in accordance with the Americans with Disabilities Act (ADA) requirements. Provide wiring and connection to all credential readers. Complete programming, adjustment, and testing of all credential readers.

F. Provide wiring and connection to all hardware request-to-exit devices that are integral to electrified door hardware. Provide wiring and connection to all request-to-exit motion detectors. Complete programming and testing of all integrated request-to-exit devices. Where possible, avoid false activation by persons passing by but not exiting.

G. Install all request-to-exit motion detectors in accordance with manufacturer's instructions directly above the door frame, centered on the door opening. Adjust sensitivity to permit operation on motion of persons within 2'-0" of door. Avoid false activation by persons passing by where possible.

H. Install all request-to-exit pushbuttons in accordance with manufacturer's instructions where shown on floor plans, in accordance with the Americans with Disabilities Act (ADA) requirements. Provide wiring and connection to all request-to-exit pushbuttons. Complete programming, adjustment and testing of all request-to-exit pushbuttons.

I. Install all door alarm contacts in accordance with manufacturer's instructions either recessed in the door header or surface mounted as required. Provide wiring and connection to door alarm contact devices. Complete programming, adjustment and testing of all door alarm contacts.

J. Install all duress switches in accordance with manufacturer's instructions, surface mounted under counter in locations shown on plans. Verify exact mounting location with Owner prior to cable rough-in or installation. For hard wired devices, provide wiring and connection to duress switch devices. For wireless duress switch devices, mount receivers in accessible locations. Complete programming, adjustment and testing of all duress switch devices. Wireless testing shall include signal reception when transmitter is in all sections of the area in which it will be used in normal operations.

K. Install, wire, configure, adjust, program and test all access control system servers, workstations, badging workstations and other user interfaces.

L. Install, wire, configure, adjust, program, and test all specified interfaces and integrations between access control and other systems. Contractor shall provide all cabling, wiring, terminations, components, devices, accessories, hardware, software and other material and accessories necessary to complete all specified interfaces and integrations and make them fully operational.

M. All low voltage access control cabling shall be routed with other low voltage cabling and shall route through cable tray and non-continuous cable support pathways to the fullest extent possible.

N. Electronic access control system cabling shall not be spliced.

O. Flexible conduit is not allowed except with prior approval. Refer to Section 26 05 33 for conduit requirements. Refer to Section 27 05 28 for cable hanger and support requirements.

P. Each cable shall be appropriately identified, as defined on the record documents, at each end's termination point using pressure sensitive label strips.

Q. The conductor color code used in terminating system cabling at system devices shall remain consistent from device to device for each unique device type throughout the project.

R. Install and tighten all connectors in accordance with manufacturer's instructions using the appropriately designed tools recommended by the manufacturer for that purpose. Do not strip or damage connectors, terminals, or equipment by over tightening termination fasteners.

S. Grounding and Bonding Requirements:

1. Provide a minimum of 6AWG bonding conductor from each electronic access control system control panel, power supply and surge suppression device to the nearest telecommunications grounding busbar. Actual bonding conductor size is determined by its length; refer to Section 27 05 26 for grounding and bonding conductor sizing criteria.
2. Cables containing shields shall not have the shields grounded at conduits, boxes, racks, etc. Ground the shield only at the control panel end.

T. Coordinate installation of all devices with other trades and utilities in the vicinity.

U. Cabling shall be plenum rated when installed outside conduit in plenum ceilings.

3.2 FIELD QUALITY CONTROL

A. Where these specifications require a product or assembly without the use of a brand or trade name, provide a product that meets the requirements of the specifications as supplied and warranted by the system vendor. If the product or assembly is not available from the system vendor, provide product or assembly as recommended by the system vendor.

B. Periodic observations will be performed during construction to verify compliance with the requirements of the specifications. These services do not relieve the Contractor of responsibility for compliance with the contract documents.

C. Furnish products listed and classified by Underwriters Laboratories, Inc. (UL) as suitable for purpose specified and indicated.

3.3 MANUFACTURER AND INTEGRATOR COMBINED FIELD SERVICES

A. Installation shall be performed by a factory-trained and certified Contractor.

B. The Contractor shall provide a comprehensive, site-specific customer planning guide for the system. The Contractor shall conduct conference(s) with the Owner prior to any installation to discuss the programming and configuration options of the system and the planning guide.

C. The Contractor shall include labor for all planning and all programming activities required to implement the Owner's access policies for each system point and each operator and administrator. Any software programmable access policy, within the bounds of the hardware specified, shall be included.

D. It shall be the responsibility of the Contractor to provide a complete, functional system as described by the design documents. These responsibilities include:

1. Complete hardware setup, installation, wiring and software configuration of the system server, all workstations and all peripheral hardware.
2. Complete programming of all operator software in accordance with the Owner's access policies determined by the planning guide conference(s).
3. Manual data entry of 75 cardholders based on a printed roster provided by the Owner.
4. Configuration of the network software for operation of the system. Templates shall be established representative of all user access right levels.
5. Programming of all cardholder database screens including cardholder information screens, report templates, queries, etc. Encoding of 75 Contactless Smart cards shall be included.
6. Programming of all custom graphic GUI screens including devices.
7. Complete system diagnostic verification.

E. The SMS Installation Contractor shall be present at meetings to coordinate all door hardware requirements with the door hardware vendor.

3.4 SYSTEM DOCUMENTATION

A. Complete documentation shall be provided for the system. The documentation shall describe:

1. All operational parameters of the system
2. Complete documentation of programming and access policies
3. Complete operating instructions for all hardware and software

B. The following sections shall be provided in the system documentation:

1. System Administrator Manual: Provides an overview and a step-by-step guide and instructions detailing all system administrator responsibilities and functions.
2. User Manual: A step-by-step guide and instructions detailing all system user functions.
3. Alarm Monitoring Manual: A step-by-step guide and instructions detailing all alarm monitoring system functions and responsibilities.
4. Technical Maintenance Manual: A comprehensive document providing all maintenance actions, system testing schedules, troubleshooting flowcharts, functional system layout, wiring diagrams, block diagrams and schematic diagrams.
5. Refer to Part 1 for details.

3.5 SYSTEM TRAINING

A. All labor and materials required for on-site system training by a certified representative of the system manufacturer shall be provided. Training shall be conducted at the project site using the project equipment.

B. Coordinate training days and times with Owner.

C. Provide a training outline agenda describing the subject matter and the recommended audience for each topic.

D. At a minimum, the following training shall be conducted:

1. System Administrators: A course detailing the system functions, configurations and operations. Provide training on all aspects of the system including data import/export, report, cardholder management, system workstation and server configuration and maintenance, software and hardware configuration and peripheral hardware operation.
2. Operators: A course detailing the operational features of all aspects of the user interface. Topics shall include alarm monitoring functions, reports, error handling, alarm handling, output relay control, operation of integrated systems interface, and general overview of the report hardware.
3. GUI Editing: Conduct detailed training on using the GUI editing software. Topics shall include the editing of existing graphical maps and the creation of new graphical maps.

E. Minimum on-site training times shall be:

1. System Administrators: Eight (8) hours.
2. Operators: Eight (8) hours.
3. GUI Editing:Four (4) hours.
4. Badging System: Eight (8) hours.
5. Four (4) additional hours of training each quarter for the 12-month period of the project warranty shall be provided. A minimum of half of this additional training shall be on site; the remainder may be support by telephone or email. Contractor shall document this training, including dates performed, trainer and Owner representative(s) present. Each phone call or email shall be documented as a minimum of 15 minutes duration.
6. Operators and administrators are present 24 hours a day, 7 days a week. Contractor shall coordinate with Owner to provide training for all appropriate personnel, which may require Contractor to be present on site during non-business hours. Therefore, the hours in any or all categories defined above may be divided among the various shifts.

3.6 SYSTEM ACCEPTANCE

A. The SMS vendor shall submit for review a formal acceptance and system checkout program. The system checkout procedures shall include all system components, software and functionality. The Contractor shall perform the tests and document all results under the supervision of the manufacturer's systems engineer.

B. All operational scenarios, as defined by the customer planning guide, shall be tested to simulate the actual use of the system in the normal operating environment. The successful completion of these operational scenarios shall be documented.

C. The system shall not be accepted until all requirements of system documentation and training have been completed.

END OF SECTION 28 13 00

SECTION 28 23 00 - VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Network Video Management System (NVMS).

B. Video Storage Solution

C. Cameras and Accessories.

D. Video Printer.

E. Equipment Racks.

F. Cabling.

1.2 RELATED WORK

A. Section 26 05 33 - Conduit and Boxes

B. Section 26 05 13 - Wire and Cable

C. Section 27 15 00 - Horizontal Cabling Requirements

D. Section 28 05 00 - Basic Electronic Safety and Security System Requirements

E. Section 28 31 00 - Fire Detection and Alarm Systems

F. Section 28 13 00 - Electronic Access Control

1.3 QUALITY ASSURANCE

A. NVMS Software Developer (Manufacturer): The NVMS system shall be a single-source manufacturer such that the single manufacturer develops, supports, and warranties the NVMS software solution. The manufacturer shall have three (3) years documented experience.

1. The software developer shall be, at a minimum, a Microsoft Gold Certified Integrator and Partner for systems that reside in a Microsoft environment.
2. The software developer shall be an active ONVIF member with current available product recognized by ONVIF as a Conformant Product.

B. Integrator/Installer (Contractor): The Contractor must be a NVMS-certified installation, service, and support company specializing in the selected manufacturer's product, with demonstrated prior experience with the selected manufacturer's system installation and programming.

1. The installer shall retain a Microsoft MCSE or equivalent technician for the purposes of server deployment, software configuration, and system integration.
2. The integrator must have local service representatives within 75 miles of the project site.

1.4 REFERENCES

A. NFPA 70 - National Electrical Code

B. Electronic Industries Association (EIA) Video Surveillance Equipment Standards

C. UL 2044 - Standard for Commercial Closed Circuit Television Equipment

D. UL 3044 - Standard for Safety for Surveillance Closed Circuit Television Equipment

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 28 05 00.

B. Product Data Submittal: Provide manufacturer's technical product specification sheet for each individual component type. Submitted data shall show the following:

1. Compliance with each requirement of these documents.
2. All component options and accessories specific to this project.
3. Electrical power consumption rating and voltage.
4. Heat generation for all power consuming devices.
5. All required wiring shall be identified.
6. Number of IP addresses that will be required from the Owner's Information Systems Department.
7. Statement of Acceptability of Designed Server:

    a. If the Contractor agrees that the server(s) designed and described herein is acceptable for the chosen manufacturer's solution and meets the demand of the application, this shall be stated in writing and submitted as part of the shop drawing submittal.
    b. If the Contractor does not agree that the server(s) designed and described herein is acceptable for the chosen manufacturer's solution, Contractor shall itemize the quantity, technical specifications, and capacities of the servers required to support the functionality and device quantities required by the project drawings. Indicate the capacity utilization factor for each server.
    c. Contractor's bid shall include any required changes in server(s) capacity.

8. Calculation for storage required using the criteria contained in the project drawings.
9. Calculation for required network bandwidth, including any latency restrictions.
10. Provide annual cost and all terms and conditions for the NVMS Software Maintenance Agreement. Include all additional costs and terms and conditions for any Annual Service Contracts provided by the Contractor for all services that are not included in the Software Maintenance Agreement.

C. System Drawings: Project-specific system CAD drawings shall be provided as follows:

1. Provide a system block diagram noting system components and interconnection between components. The interconnection of components shall clearly indicate all wiring required in the system. When multiple pieces of equipment are required in the exact same configuration (e.g., multiple identical cameras), the diagram may show one device and refer to the others as "typical" of the device shown.

D. Sample format of site specific programming guides to be used for system planning/programming conference with Owner.

E. Meeting agenda for planning/programming conference required in Part 3 of this specification.

F. Submit detailed description of Owner training to be conducted at project end, including specific training time.

G. Quality Assurance:

1. Provide materials documenting experience requirements of the manufacturer and installing contractor.
2. Provide system checkout test procedure to be performed at acceptance. Test procedures shall include all external alarm events.

H. Coordination Drawings:

1. Include all ceiling-mounted devices in composite electronic coordination files. Refer to Section 28 05 00 for coordination drawing requirements.

1.6 SYSTEM DESCRIPTION

A. This specification section describes the furnishing, installation, commissioning and programming of a complete, turnkey, closed circuit television system.

B. Performance Statement: This specification section and the accompanying project drawings are performance based, describing the minimum material quality, required features, and operational requirements of the system. These documents do not convey every wire that must be installed and every equipment connection that must be made. Based on the equipment constraints described and the performance required of the system as presented in these documents, the vendor and the Contractor are solely responsible for determining all wiring, programming and miscellaneous equipment required for a complete and operational system.

C. Refer to the project drawings for model numbers for the Basis of Design for all equipment.

1.7 OWNER-SUPPLIED MATERIALS

A. network switches

1.8 LICENSING REQUIREMENTS

A. All licenses required for system operation shall be included in the Contractor's bid. Licenses shall include, but not be limited to, server and workstation software, cameras, encoders/decoders, and any other licensing that is required by the manufacturer for operation of any system component.

1. Camera licenses shall be provided for all cameras listed on the Camera Schedule whether cameras are new or existing.
2. The system shall be provided with installed software capacity to accommodate a minimum quantity of 60 cameras. The licensing for all 60 cameras shall ***NOT*** be included in the Contractor's bid. Licensing shall only be included for the quantity of cameras shown on the Camera Schedule. However, the system's ability to support up to a total capacity of 60 cameras shall ***ONLY*** require future payment of additional per-unit camera licensing fees by the Owner. In no case shall the Owner be required to upgrade the software provided in the Contractor's bid to achieve support for a total of 60 cameras, including the payment of any software upgrade fees, installing a different software version, etc.
3. If the manufacturer requires the purchase of a block of licenses (instead of selling a single license for a single device) the Contractor's bid shall include the appropriate block of licenses that accommodates all device quantities described by the project drawings, plus 6 additional devices for future growth.
4. Camera licensing that is restricted to a particular device MAC address or in any way is only valid for a particular manufacturer or model number is not acceptable. Camera licenses shall be issued such that the Owner can replace a camera with another camera brand and/or model number and transfer the license from the old camera to the new camera at no additional cost at any future time. This license transfer procedure shall be capable of being performed by the Owner and shall not require the services of an integrator.

    a. Exception: When a camera license is issued as a no-cost license in the limited condition that the NVMS manufacturer and the camera manufacturer are the same company, it is permissible to charge a future license fee to the Owner if the Owner elects to replace the NVMS manufacturer-branded camera with a third-party manufacturer's camera.

5. The Contractor shall fill out the NVMS Bid Inventory Form located herein and provide at the time of bid.

1.9 PROJECT RECORD DOCUMENTS

A. Submit documents under the provisions of Section 28 05 00.

B. Provide final system block diagram showing any deviations from shop drawing submittal.

C. Provide statement that system checkout test, as outlined in shop drawing submittal, is complete and satisfactory.

D. Provide final camera type and camera requirements schedules documenting all changes made during construction.

E. Warranty: Submit written warranty and complete all Owner registration forms.

F. Complete all operation and maintenance manuals as described below.

1.10 OPERATION AND MAINTENANCE DATA

A. Submit documents under the provisions of Section 28 05 00.

B. Manuals: Final copies of the manuals shall be delivered within 14 days after completing the installation test. Each manual's contents shall be identified on the cover. The manual shall include names, addresses, and telephone numbers of the contractor responsible for the installation and maintenance of the system and the manufacturer for each piece of equipment for each system. The manuals shall have a table of contents and labeled sections. The final copies delivered after completion of the installation test shall include all modifications made during installation, checkout, and acceptance testing. The manuals shall consist of the following:

1. Hardware Manual: The manual shall describe all equipment furnished including:

    a. General description and specifications.
    b. Installation and check out procedures.
    c. System layout drawings and schematics.
    d. Alignment and calibration procedures.

2. Software Manual: The software manual shall describe the functions of all software and shall include all other information necessary to enable proper installation, testing, and operation. The manual shall include:

    a. Definition of terms and functions.
    b. System use and application software.
    c. Graphical user interface use.
    d. Reports generation.

3. Operator's Manual: The operator's manual shall fully explain all procedures and instructions for the operation of the system including:

    a. Computers and peripherals.
    b. System startup and shutdown procedures.
    c. Use of system.
    d. Recovery and restart procedures.
    e. Use of report generator and generation of reports.
    f. Data entry.
    g. Operator commands.
    h. Alarm messages.
    i. System permissions functions and requirements.

4. Maintenance Manual: The maintenance manual shall include descriptions of maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

1.11 WARRANTY

A. Unless otherwise noted, provide warranty for one (1) year after Date of Substantial Completion for all materials and labor.

B. Onsite Work During Warranty Period: This work shall be included in the Contractor's bid and performed during regular working hours, Monday through Friday.

1. Inspections: Perform one minor inspection six-months after Substantial Completion and one major inspection prior to the expiration of the warranty.
2. Minor Inspections: Inspections shall include:

a. Visual checks and operational tests of all equipment, field hardware, and electrical and mechanical controls.
b. Mechanical adjustments if required on any mechanical or electromechanical devices.
c. Install all available software updates, patches, or bug fixes available from the NVMS manufacturer.

3. Major Inspections: Inspections shall include all work described under paragraph Minor Inspections and the following work:

a. Clean all equipment, including interior and exterior surfaces.
b. Perform diagnostics on all equipment, including all system software diagnostics, and correct all diagnosed problems.
c. Adjust all camera alignments that have become out of alignment from their documented position at Substantial Completion.
d. Install all available software updates, patches, or bug fixes available from the NVMS manufacturer.
e. All warrantable system deficiencies during the Major Inspection shall be remedied under warranty at no cost to the Owner.

C. Operation: Upon the performance of any scheduled adjustments or repairs, verify operation of the NVMS system.

D. Emergency Service: The Owner will initiate service calls when the NVMS system is not functioning properly. Qualified personnel shall be available to provide service within the distance defined above. The Owner shall be furnished with telephone number(s) where service personnel can be reached 24/7/365.

E. Records and Logs: Keep records and logs of each task completed under warranty. The log shall contain all initial settings upon Substantial Completion. Complete logs shall be kept and shall be available for review on site, demonstrating that planned and systematic adjustments and repairs have been accomplished for the NVMS system.

F. Work Requests: Record each service call request on a service request form. The form shall include the model and serial number identifying the component involved, its location, date and time the call was received, specific nature of trouble, names of service personnel assigned to the task, instructions describing what must be done, the amount and nature of the materials used, the time and date work started, and the time and date of completion. Deliver a record of the work performed within five (5) days after work is accomplished.

G. System Modifications: Make any recommendations for system modification in writing to the Owner. No system modifications shall be made without prior approval of the Owner. Any modifications made to the system shall be incorporated into the operations and maintenance manuals, and other documentation affected. To the fullest extent possible, the Owner shall be provided with electronic restorable versions of all configurations prior to the modifications being made.

H. Software: Provide all software updates during the period of the warranty and verify operation in the system. These updates shall be accomplished in a timely manner, fully coordinated with NVMS system operators, shall include training for the new changes/features enabled, and shall be incorporated into the operations and maintenance manuals, and software documentation.

I. Refer to the individual product sections for further warranty requirements of individual system components.

1.12 SOFTWARE MAINTENANCE AGREEMENT/ANNUAL SERVICE CONTRACT

A. Provide annual cost and all terms and conditions for the Software Maintenance Agreement (SMA) provided by the NVMS manufacturer and/or the Contractor.

B. The Owner will enter into a contract directly with the vendor. This specification is not a contract between the Owner and the vendor to perform these services. The cost and terms of the SMA may be used by the Owner for NVMS solution selection.

PART 2 - PRODUCTS

2.1 NETWORK VIDEO MANAGEMENT SYSTEM - GENERAL REQUIREMENTS

A. The network video management system (NVMS) shall be an enterprise-class client/server based video security solution that provides management of digital video, audio and data across a TCP/IP network.

B. Provide a turnkey solution that includes furnishing, installation, and configuration of a separate IP network, complete with all required network electronics, switches, and other hardware. The VMS shall utilize network switch ports provided by the Owner for all required IP connections. Provide the Owner with a complete list of all IP ports required.

C. ONVIF Compliance:

1. The NVMS system shall be ONVIF certified as an ONVIF Network Video Client.

2. Cameras shall be ONVIF certified as an ONVIF Network Transmitter unless specifically noted as an exception to this requirement in the project drawings.

D. The NVMS system shall be an "open system."

1. To meet this requirement, the NVMS must directly support cameras from a minimum of three (3) readily available camera manufacturers.
2. The three (3) camera manufacturers must have no corporate relationship to the NVMS manufacturer.
3. "Directly support" shall be defined as plug-n-play using drivers that are commercially available at the time of bid that utilize the ONVIF specification as the means of integration.
4. In addition to the requirement to support three (3) independent manufacturer's cameras, the NVMS may support an unlimited additional quantity of in-house or other proprietary cameras.
5. The open system shall not require proprietary storage solutions. It shall support third party storage solutions, including:

    a. Commercially available Direct Attached Storage (DAS) devices.
    b. Network Attached Storage (NAS) devices.
    c. Storage Area Networks (SAN) for primary or archival storage purposes. Primary support for SAN shall be defined as:

        1) The ability to directly record to SAN device without first recording to an NAS or DAS.
        2) The NVMS is provided with a user experience that makes the video recorded to the SAN transparent to the user. This shall be defined as:

            a) Full search, bookmarking, and other software features for finding, marking, locating, and identifying video are supported by the NVMS for video recorded to a SAN in an identical way to video that is recorded to an NAS or DAS.
            b) No loading of the video from the SAN into the NVMS shall be required.
            c) Full playback, windowing of camera video, archiving, and exporting is supported by the NVMS for video recorded to the SAN in an identical way as video recorded to an NAS or DAS.

6. The system must have a published API/SDK permitting third party integrations to the product without restrictions.
7. The NVMS shall support active directory using LDAP protocol.

E. The NVMS system shall consist of the following hardware/software components:

1. Software:

    a. Server and client
    b. Recording services, archival services, and storage management
    c. Configuration tools

2. System storage as specified on the project drawings.
3. Cameras and related hardware as specified on the project drawings.
4. Hardware: Servers, workstations, and miscellaneous hardware (keyboard, mouse, KVM) as specified on the projects drawings.
5. Network electronics and related hardware and software as specified on the project drawings.

F. Video from any camera on the system (on the LAN, WAN or Internet) shall be capable of being viewed from single or multiple workstations simultaneously at any time, limited only by network bandwidth.

G. The NVMS shall support simultaneous displaying of live (30 fps) video of a minimum of 16 cameras while the video monitoring screen is configured in a 16-camera split configuration. In no case shall the frame rate of the camera be required to be restricted to less than 30 fps to display a 16-camera split view.

H. Simultaneous display and recording of every camera shall be supported with independent user-adjustable frame rates that can be set differently for the display stream and the recording stream. These independent settings shall be unique per camera.

I. The NVMS monitoring software shall support any combination of recorded and live video in any multiple camera split view, including viewing recorded video and live video from the same camera.

J. The NVMS shall support continuous recording and event-based recording simultaneously. This shall be capable of being set on a per camera basis.

K. Viewing of video (live and recorded) shall be possible from client software from any client hardware that is connected to the security LAN/WAN or Internet (through appropriate firewalls). In addition, system administration shall be permitted from remote client hardware.

2.2 NVMS MANUFACTURERS

A. Basis of Design:

1. Avigilon
2. Genetec
3. Milestone
4. Salient Software
5. Pelco
6. Vicon

2.3 NVMS SERVER REQUIREMENTS

A. The NVMS shall operate on the Windows 2008 Server Operating System. The server software shall be a multi-tasking, multi-threading application system architecture designed specifically for the Windows environment.

B. The server shall communicate on a TCP/IP based Ethernet LAN capable of utilizing 100/1000BaseT.

C. The server shall be provided by the NVMS system vendor.

D. The server(s) requirements have been calculated based on the NVMS Basis of Design manufacturer noted above. By submitting a bid, the Contractor acknowledges that the calculated server requirements listed here may not be sufficient for a listed alternate, acceptable manufacturer selected by the Contractor. The Contractor shall modify the calculated server requirements listed herein based on the calculated requirement of the chosen manufacturer. The server requirements for the basis of design are as follows:

1. Server Quantity and Location: Refer to project drawings for quantity of servers required and their location.
2. Server Hardware Specification:

    a. Processor: Dual 2.6 KHz 6-core
    b. RAM: 8 GB
    c. On-Board Storage:Two (2) 500GB 7200 RPM drives in RAID1 configuration to be used only for the server software. This is not the required video storage capacity.
    d. Video Card: 8 GB Video Card Matrox G200eW or equal
    e. Power Supplies: Two (2) redundant 750W power supplies.
    f. Accessories: Keyboard, mouse, 22" 16x9 widescreen monitor, Gigabit Ethernet.
    g. Operating System: Windows 2008 Server 64-bit.

E. The NVMS shall operate on SQL Server 2012. All licensing shall be included in the Contractor's bid.

2.4 NVMS CLIENT REQUIREMENTS

A. The NVMS PC workstation(s) shall be provided by the NVMS system vendor

B. The workstation(s) for the basis of design are as follows:

1. Workstation Quantity and Location: Refer to project drawings for quantity of servers required and their location.
2. Workstation Hardware Specification:

    a. Processor: Intel Core i5, or equal
    b. RAM: 4 GB
    c. On-Board Storage: One (1) 500GB 7200 RPM drive to be used only for required client software. This is not the required video storage capacity.
    d. Video Card: 2 GB on-board video card.
    e. Accessories: Keyboard, mouse, 25" 16x9 widescreen monitor, 802.11 A/B/G WIFI, on-board sound card, Gigabit Ethernet adapter.

3. Operating System: Windows 10 64-bit.

2.5 NVMS SYSTEM DETAILED REQUIREMENTS

A. Network Requirements: The NVMS shall support Ethernet 10/100 BaseT and Gigabit Ethernet.

1. Network protocols shall be supported including TCP/IP, IPX, and UDP.
2. The network interface shall allow remote access of the NVMS from anywhere on the end-user's LAN/WAN or Internet (behind firewall).
3. The system shall permit limiting of frame rate transmission to individual clients.
4. Both Multicast and Unicast shall be supported.
5. All transmission of system data shall be secured using Secure Socket Layer (SSL) security on the TCP/IP network.
6. Simple Network Management Protocol (SNMP) shall be supported.

B. Video Formats:

1. The NVMS shall support MPEG-4, and H.264 compression formats.
2. The system shall support any single stream of bandwidth up to 90Mbit/sec at 30 fps at 4872 x 3248 resolution with no system performance degradation, assuming appropriate network bandwidth.
3. Video shall be recorded using a 256-bit encryption algorithm with authentication (watermarking) software suitable for evidentiary proceedings. The watermarking feature shall provide evidence of altered video.

    a. The video shall be watermarked with the authentication key/signature during recording of live video to the drive.
    b. A video player shall be provided with the NVMS system.

        1) The player shall have the ability to validate the authentication upon playback.
        2) This authentication shall provide the storage media name, camera name, video time, and user information.
        3) The authentication shall have the ability to be password protected.

4. Resolution:

    a. The camera resolution shall be user selectable on a per-camera basis. Selecting or changing resolution shall not require a restart of the application, server, or workstation.
    b. The system shall support the following resolutions:

        1) NTSC Resolutions: 0CIF (176 x 120), CIF (352 x 240), 2CIF (704 x 240), 4CIF (704 x 480).
        2) VGA Resolutions: QVGA (320 x 240), VGA (640 x 480), SVGA (800 x 600), XVGA (1024 x 768), 4xVGA (1280 x 960).
        3) Megapixel Resolutions: SXGA (1280 x 1024: 1.3MP), SXGA + EXGA (1400 x 1050: 1.4 MP), UXGA (1600 x 1200: 1.9MP), WUXGA (1920 x 1200: 2.3MP), QXGA (2048 x 1536: 3.1MP), WQXGA (2560 x 1600: 4.1MP), QSXGA (2560 x 2048: 5.2MP), 3296 x 2472: 8MP, 4000 x 2672: 11MP, 4864 x 3248: 16MP, 6576 x 4384: 29MP.

            a) 16:9 and 4:3 formats shall be supported.

        4) HDTV Resolutions: 720p, 1080(i/p) in 16:9 format.

C. Remote Clients:

1. The NVMS system shall include the ability to view live video or playback recorded video over the LAN/WAN or the Internet from any PC. This function shall NOT require any installed client software. An industry standard Web Browser (e.g., Internet Explorer, Firefox, Chrome) shall be the only software required to view non-authenticated video from a remote PC.

    a. Any plug-ins (e.g., ActiveX, Java, Flash) required to view remote video shall be capable of being pushed to the user's PC at the time of initiating the remote video viewing session.
    b. Remote viewing shall be supported whether the remote client is:

        1) Inside the firewall containing the NVMS.
        2) Outside the firewall containing the NVMS.
        3) Accessing the NVMS through a VPN.

2. Remote Client Features:

    a. Display live video.
    b. Digital zooming and panning of fixed cameras.
    c. PTZ camera control in real time, including adjusting PTZ lock and dwell times.
    d. Ability to access video from all accessible recording devices.
    e. Priority-based camera control takeover.
    f. Customizable camera viewing screen split configurations that are retained under the user login between remote client sessions.

D. Mobile Clients (Apps):

1. The NVMS shall include a mobile video viewing application for the iOS/Apple and Android operating system.

    a. The iOS application shall be a single universal application supporting both the iPhone 4s and iPad 2 resolutions. An iPhone application that scales up for use on the iPad using the iPad 1x/2x feature is not acceptable.
    b. The Android application shall be a universal application that supports Android smartphones and Android tablets. The Android application shall support Android codeset name Ice Cream Sandwich and may require a minimum installed codeset of Gingerbread.

2. Features:

    a. The mobile client shall permit viewing of live video or playback of recorded video.
    b. Split screen video display shall be supported. The split screen shall permit live and recorded video simultaneously in the screen split. The screen split layout shall be retained between mobile client sessions.
    c. Provide time synchronization of the video of different cameras to account for mobile network latency to ensure that live video from multiple cameras is time synchronized.

d. The mobile client shall be optimized with video compression to support video viewing on mobile networks. The mobile client shall maintain a minimum of 7 fps per camera on a mobile network performing at 200 Kbit/s with a latency of 200ms.
e. All transmission of system data shall be secured using Secure Socket Layer (SSL) security at a minimum.

3. Licensing:

a. Provide licensing for 12 iOS mobile clients.
b. Provide licensing for 12 Android mobile clients.

E. Workstation Client Software Requirements:

1. The client software for the NVMS shall run as an application on Windows 7 64-bit. The client software shall not require a PC more robust than that defined above in the section entitled "NVMS CLIENT REQUIREMENTS." Should the workstation client software require a PC configuration more robust than that defined herein, the cost of upgrading the workstation hardware to the more robust requirement shall be paid by the Contractor.
2. Licensing:

a. Provide licensing for 3 concurrent clients on the system.

3. The client software shall provide video signal detection and provide alerts whenever video is lost on any input channel.
4. Updates to the client software shall be capable of being pushed to all clients from the NVMS server.
5. The client software shall provide a graphical mapping feature. The graphical map shall accommodate the importation of CAD files, or custom development of floor plans or site plans to create a to-scale or not-to-scale graphical representation of the system layout including all cameras.

a. Cameras located on the graphical map shall be "live," which is defined as the ability to click the camera in the graphical user interface (GUI) to see camera information and live video. The camera name shall be available to the user via a "mouse hovering" maneuver over the camera icon.
b. For site cameras, the graphical map shall consist of an overall site plan showing all exterior cameras. Buildings and other physical entities on the site shall be graphically represented.

1) The buildings shown on the site plan shall visually indicate to the user that cameras are located inside that building's interior, if applicable.

c. The user shall be able to click a building that contains cameras to obtain a new graphical layout of that building. Once the building interior layout graphical map is on screen, interior cameras shall be represented by icons.
d. The user shall have the ability to navigate back to the main (previous) graphical map via a single-click graphical icon.

6. Camera Configuration:

    a. Each camera shall be configurable for a 32-alphanumeric character name.
    b. The system shall allow for the setup and adjustment of brightness, contrast, archiving, motion detection, and Pan/Tilt/Zoom on a per camera basis.
    c. The NVMS shall support a separate frame rate for recording and a separate frame rate for viewing for every camera input (assuming the camera provides two streams). These frame rates shall be capable of being independently set for each camera input.
    d. The NVMS shall support the PTZ control of analog NVMS cameras through the encoders.
    e. The compression algorithm formats MJPEG and MPEG4 shall be supported in the same system and shall be individually selectable on a per-camera basis.
    f. Each individual camera shall be capable of having individual camera settings that shall include (at a minimum):

        1) Continuous recording.
        2) Motion-based recording capability shall be provided including:

            a) Motion as determined by the NVMS software using:
            b) Motion as determined at the camera.
            c) Motion trigger by digital inputs from external trigger systems such as contact closures, alarm inputs, POS integration, etc.
            d) Motion triggers received by external trigger inputs shall be recorded by the event recording capabilities of the NVMS and identifiable on a timeline during playback and in reports.

        3) Alarm-initiated recording.

            a) When a camera enters alarm recording mode, the NVMS shall have the capability of changing to different camera settings for the recorded video during the duration of the alarm mode. The settings capable of being changed shall include the frame rate and the resolution. These setting changes shall be configurable in advance per camera by the User through the software GUI.

        4) Time-based recording on a preset schedule.
        5) Manual (user) activation of the start and stop of the recording process through the GUI.

            a) The NVMS software shall prevent any user from manually starting and stopping the recording of video based on that user's login credential.

        6) Defined pre-event and post-event recording buffers shall be provided for all non-continuous recording events.
        7) Each camera shall be capable of having unique storage retention settings.

g. The NVMS shall support unidirectional audio recording utilizing the built-in audio recording capability of audio-equipped IP cameras.

F. Software Security Requirements:

1. All users shall be capable of being authenticated against Active Directory using LDAP, before being granted system access. Should the Owner not use Active Directory, the NVMS shall provide a built-in login and credential management tool to permit rules-based access rights on a per-user basis.
2. The access rights shall be selectable on a per-user basis. In addition, user groups shall be capable of being assigned whereby each user group has a common set of access rights. Users shall be capable of being assigned to these user groups by the system administrator.
3. Access rights available for customization shall include:

a. Live Video Viewing:

1) Use of PTZ controls.
2) Start and stop of manual recording.
3) Access to and exclusive from individual cameras and monitors.
4) Access to system settings.
5) Ability to define video blocking positions of PTZ cameras for certain users.

b. Viewing Recorded Video:

1) Ability to export recorded video. including email.
2) Access to system archiving and backup.
3) Ability to watch recorded video from individual cameras.
4) Ability to delete recorded video.

c. Camera Setup:

1) Add or remove cameras from the system.
2) Change camera settings including resolution and frame rate.
3) Change motion detection and other defined triggers.

d. General Settings:

1) Change client software settings.
2) Ability for user to configure or change custom viewing screen configurations.
3) Modify server settings.
4) Change recording or bandwidth settings.
5) Configure users.
6) Access and configure external messaging capabilities.
7) View, print, save and clear the system log.

G. Pan/Tilt/Zoom (PTZ) Control:

1. The NVMS shall support PTZ control from any client, including remote and mobile clients.
2. The following PTZ features shall be supported:

    a. Priority Levels
    b. Device Group Control
    c. PTZ Override (Lockout)
    d. Proportional PTZ Control
    e. Preset Lock via video screen
    f. Preset Tour

H. Video Archiving:

1. The archiving feature shall be hardware independent, providing the ability to utilize commercial off-the-shelf mass storage devices as archived video destinations, including optical DVD, DAS, NAS, SAN, and other external storage drives.
2. The archiving software shall provide the ability to manage and store video information from multiple recorded video locations to a central location.
3. Each NVMS server shall have the ability to set its own unique archiving settings. Video shall automatically be archived based on user-defined "percentage full" settings. When the NVMS reaches the designated capacity threshold, video shall be automatically copied to the archive storage destination, and space on the source of the recorded video shall be released for overwrite by new video information using a first-in, first-out algorithm.

    a. Exception: Video marked or tagged by the user or by automated alarm inputs shall be retained by the archiving process despites its location in the first-in, first-out timeline.

4. Regardless of the video's storage location (local or in the archive), the NVMS software shall automatically retrieve video associated with an event on demand by the user in response to a search, browse, or other retrieval action. The actual storage location of the video shall be transparent to the user.

    a. Exception: Video archived to removable media (e.g., removable hard drives or optical DVD) shall require prompting to the user to insert the appropriate media.

5. Archiving shall be capable of being scheduled such that archiving will only run during certain hours defined by the Owner.
6. The NVMS solution shall be permitted to utilize advanced algorithms for managing onboard storage such as reducing the frame rate of recorded video for the oldest video as an alternative to completely removing the video using a first-in, first-out algorithm. If this option exists in the NVMS software, it must have the following features:

    a. Ability of the Owner to completely disable the feature.
    b. Ability to set a minimum frame rate that the system will not exceed.
    c. Ability to set the feature on a per-camera basis.

I. Video Viewing Layouts:

1. The NVMS shall support the ability to save the list of camera views currently being displayed, along with the currently selected template, with a user-defined name to be loaded as needed by the system operator.
2. System operators shall have the ability to define multiple viewing templates that can be recalled and configured on an as-needed basis.
3. This feature shall be subject to the access rights provided by the system administrator through their login credential.

J. Still Image Capture/Save:

1. During playback or monitoring of video, the system shall have the ability to create and save a still picture. This operation shall not affect any other operation and shall not alter the recorded video. The file format shall be an industry standard format (JPEG, TIFF) allowing for file transfer via e-mail, printing, or file transfer to other media.
2. This feature shall be subject to the access rights provided by the system administrator through their login credential.

K. Export Video Clip to File:

1. The NVMS shall have to ability to save and export recorded video to a file (MPEG, AVI) for sharing and reviewing video clips. The start and end times for each video segment shall be user defined. The exported video clip shall be viewable via a standard Windows media player.
2. This feature shall be subject to the access rights provided by the system administrator through their login credential.

L. Automated Motion Video Searching:

1. The system shall support advanced automated motion video searching against pre-recorded video. The automated motion video search shall analyze frames in a video segment to detect motion activity from image to image. It shall display thumbnail images of the frames with activity, complete with a histogram depicting the relative amount of activity within each frame.
2. The search shall be defined by selecting a specific camera and a specific time period in which the suspected activity took place. All motion events associated with that camera and time period shall be displayed in either a trace or thumbnail format for review.
3. Motion shall be capable of being restricted to any user-defined area of the screen as drawn by the user using a windowing tool in the software.

M. Video System Analytics (VSA):

1. The NVMS shall provide an embedded Video System Analytics solution.
2. The result of a trigger of an VSA shall be user definable and shall include:

    a. Marking video.
    b. Adjusting recording characteristics including frame rate and resolution.

c. Activating changes in the monitoring of cameras, including showing full screen video of the triggered camera.
d. Providing screen prompting to the system operator.

3. The set of Intelligent Video Analysis algorithms shall provide the following functionality:

a. Alert Types:

1) Smart Video Motion Detection. This VSA shall have algorithms to filter out minor vibrations. The sensitivity of this filter shall be user adjustable. This VSA shall also provide motion masking where the user can define an area of the frame where motion will be ignored.
2) Camera Tampering. When the VSA detects a camera is moved from its original position, when the camera view is obstructed, or when the focus is changed, this VSA shall activate.
3) Sudden Change in Light Intensity. This VSA shall trigger when there is an extreme change in ambient light - light to dark or dark to light. The sensitivity of this VSA shall be user definable.
4) New Object in Scene. This VSA shall detect an object that was not present when the VSA originally learned the scene or that has been inserted into the scene in a user defined area in the field of view.
5) Object Removed from Scene. When an object that was present when the VSA originally learned the scene view has been removed from the scene, this VSA shall activate. This VSA shall be capable of being applied to a window of the total field of view as defined by the user.
6) Specific Object Detected in Scene. This VSA shall trigger when an object is detected that is defined by specific properties including people, automobiles, or an object of a specific color.
7) Congestion in Defined Area. This VSA shall occur when the VSA detects congestion in a specific area of the scene as defined by the user.
8) Directional Motion VSA shall occur when the VSA detects an object moving in a direction specified in the setup of this feature.
9) Object Crosses a Defined Region. This VSA shall detect an object moving across a virtual boundary or into a defined area from a specified direction.
10) Moving Object Stops. This VSA shall detect when a moving object in the scene ceases to move.
11) Static Object Starts to Move. VSA shall occur when the VSA detects when a static object in the scene starts to move.
12) Object Moves Too Fast. This VSA shall trigger when an object is moving faster than a pre-defined speed.
13) Loitering. This VSA shall detect when a person or group of people in the scene slows down or ceases to move for a specified period of time.
14) Detection of a Human Face. This VSA shall trigger when the VSA detects a frontal view of a human face.

15) People Counting. This VSA shall be used when a camera is positioned in a top-down view of an entry/exit portal. This feature shall provide an alarm with a positive count for entry and a negative count for exit.

b. The VSA shall support the ability to store the graphical output for a specific event for use with VSA alarms. This feature shall allow the graphical output of a specific event to be stored as a file and later used as an overlay to be used and associated with an alarm for historical searching.
c. The VSA shall support CIF, 4CIF, and D1 video resolutions during video processing.
d. The VSA shall support video infrared imaging.

N. The NVMS shall provide up to 10 different and independent programmable recording schedules.

1. The schedules may be programmed to provide different record frame rates for day, night, and weekend periods, as well as holidays and exception days.
2. Advanced task schedules may also be programmed that could specify allowed log-on times for user groups, when events may trigger alarms, and when data backups and archiving should occur.

O. The VMS shall support Dual Authorization logon. It shall function as follows:

1. Dual Authorization user groups may be created.
2. Logon pairs, consisting of any two normal user groups, may be assigned to each Dual Authorization user group.
3. A separate set of privileges and priorities can be assigned for each Dual Authorization user group.
4. For each user group assigned as part of a logon pair, it shall be configurable whether the group can:

a. Log on either individually or as part of the logon pair.
b. Log on only as part of the logon pair.

5. If a user that is part of logon pair logs on individually, then the user shall receive the privileges and priorities of the user's assigned user group. If the same user logs in as part of a logon pair, then the user shall receive the privileges and priorities assigned to the Dual Authorization group to which the pair is assigned.

P. The NVMS shall auto-discover cameras and encoders. Device detection shall support devices in different subnets.

Q. The NVMS shall be designed in such a way that server downtime or loss of communication to the server does not affect the functionality of the recording services. Normal recording and motion recording shall continue during server downtime.,

2.6 NVMS RECORDING REQUIREMENTS

A. The NVMS shall provide management of the recording and playback of video, audio, and data (bookmarking, alarm data, etc.).

B. Refer to the Camera Schedules on the project drawings for specific variables to be used on a per-camera basis for the purpose of calculating storage capacity and retention.

1. Total distributed storage requirements shall be determined based on a minimum of 60 days storage retention.
2. Cameras, unless otherwise noted on the Camera Schedule(s), shall be assumed to be recording 24 hours per day, 7 days per week, 365 days per year. Specific per-camera assumptions stated on the Camera Schedule for percent motion shall be used in the storage calculation.
3. Compression shall be permitted to be used in the storage calculation. The compression algorithm (MPEG-4, H.264, etc.) shall be used on a per-camera basis. If the NVMS permits variable levels of compression intensity, the use of the "average" or "medium" level setting shall be used in the storage calculation unless otherwise noted.
4. The Contractor shall provide the complete storage analysis and calculation as a shop drawing.

C. Network Video Recorder (NVR) Hardware Platform:

1. The NVR shall be defined as a storage device for recording IP video streams from IP cameras or from analog cameras that have been encoded to IP. In both cases, the NVR shall record IP streams from cameras or encoders located anywhere on the IP network without being direct-cable connected to the NVR.
2. Refer to the project drawings for specific requirements, model numbers, and basis of design for the NVR.
3. NVR Configuration:

    a. The NVR shall contain one hard drive for the operating system and software, and all hard drive storage required to achieve the required storage retention.
    b. Provide with RAID 5 hard disk controller configuration for the video storage hard drives.

4. The NVMS shall provide a failover function where an NVR can be assigned as a backup to other NVRs. When an assigned NVR goes out of service, the failover NVR takes over the responsibilities of the failed NVR. When the primary NVR returns to service, the control shall be automatically transferred back to the primary NVR.
5. It shall be possible to assign a redundant NVR to every NVR for use in normal operation of all NVR(s) in the system. The redundant NVR shall record the same streams as the primary NVR. The redundant NVR shall have its own disk drives where it shall store the recorded data.

    a. It shall be possible to view the data recorded by the redundant NVR in the client software. The redundant NVR shall have camera symbols that can be placed in the camera selection tree. These cameras shall have the same name as the cameras of the primary NVR. An indication shall be provided to indicate that the camera names are located on the redundant NVR.

2.7 NVMS ALARM REQUIREMENTS

A. The NVMS shall provide the capability to accept external alarm triggers in the following formats:

1. Momentary or maintained low voltage contact closures
2. Digital I/O (0 / 10V DC)
3. RS-232 integration
4. Custom integration

B. Alarms shall be capable of being scheduled such that they are only active during defined times.

C. The NVMS shall allow alarms to be individually restricted to specific user groups or users.

D. A single alarm event shall be capable of activating a series of output events including:

1. Mark recorded video.
2. Initiate an email, text message, or both.
3. Initiate an on-screen alarm prompt in a segmented "Alarm Queuing Window."
4. Modify recorded video settings including resolution and frame rate.
5. Modify video viewing options including bringing associated video full screen on any output.

E. The alarm queue shall display alarms in order of their priority, with rows for higher priority alarms always displayed above lower priority alarm rows. The display order for equal priority alarms shall be selectable between new alarms displayed above existing alarms or new alarms displayed below existing alarms.

F. Alarm Processing: The video management system shall operate as follows:

1. When an alarm is accepted by a user, it shall be removed from the other users' alarm lists.
2. The user shall be able to cancel acceptance of any alarm that has been previously accepted. In this case, the alarm shall re-appear in the alarm lists of all members of the user groups assigned to this alarm.

G. The NVMS shall support the association of workflows with alarms. Workflows shall consist of action plans and comment boxes. An action plan shall display a text document, HTML page, or web site that typically contains instructions for handling the alarm. Comments entered in the comment boxes shall be logged in the system logbook.

1. The NVMS shall be configurable to force an alarm workflow. In this case, the alarm cannot be cleared until the workflow is processed.

H. The NVMS shall offer the possibility to automatically clear alarms when the originating event condition is no longer true.

I. Alarms shall be capable of being configured to send cameras to defined positions.

2.8 NVMS CABLING

A. Refer to Division 27 for all cabling requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with the manufacturer's instructions and recommendations for installation of all products.

B. Provide all system wiring between all components as shown on the project drawings or as directed by the manufacturer, whichever is the more stringent requirement.

C. Mount all cameras in the approximate locations shown on the drawings. Coordinate installation with other trades and utilities in the vicinity. Cameras containing fixed lenses, moved by more than 1'-0" from their location shown on the drawings, shall have a new lens calculation performed by the Contractor. Provide Architect/Engineer with results of lens calculation before proceeding with installation.

D. Coordinate with Owner's IT Department to acquire network connections as well as any network configuration information, such as IP numbers, that will be required to connect NVMS to Owner network (if applicable).

E. Provide all low voltage and +120 VAC power to all devices as required for proper system operation. Refer to Sections 26 05 33 and 26 05 13 for further requirements.

F. All low voltage security wiring shall be routed with other low voltage cabling and shall use the cable tray to the fullest extent possible.

G. Cabling shall be plenum rated when installed outside of conduit in plenum ceilings.

3.2 FIELD QUALITY CONTROL

A. Where these specifications require a product or assembly without the use of a brand or trade name, provide a product that meets the requirements of the specifications as supplied and warranted by the system vendor. If the product or assembly is not available from the system vendor, provide product or assembly as recommended by the system vendor.

B. Periodic observations will be performed during construction to verify compliance with the requirements of the specifications. These services do not relieve the Contractor of responsibility for compliance with the project drawings.

C. It shall be the Contractor's responsibility to correct all inadequate picture quality issues prior to acceptance of the system.

3.3 MANUFACTURER'S FIELD SERVICES

A. Installation shall be performed by a factory-trained and certified Contractor.

1. Provide a comprehensive, site-specific customer planning guide for the system. Conduct a conference with the Owner prior to any installation to discuss the programming options of the system and the planning guide. The result of this planning guide shall be the determination of the system options for each device and for the software.

B. Include labor for all planning and all programming activities required to implement the Owner's operational preferences for each device and software. Any software programmable option, within the bounds of the capabilities of the hardware specified, shall be included.

C. Provide a complete, functional system as described by the project drawings. These responsibilities include:

1. Complete hardware setup, installation, wiring, and software configuration of the system, including all remote operator locations and all peripheral hardware.
2. Complete programming of all hardware and software options in accordance with the Owner's preferences as determined by the planning guide conference.
3. Programming of all custom graphic GUI screens including devices.
4. Complete system diagnostic verification.

D. Provide an authorized manufacturer representative to commission the system and ensure that facility-wide standards and project setup procedures are adhered to.

3.4 SYSTEM ACCEPTANCE

A. Submit for review a formal acceptance and system checkout program. The system checkout procedures shall include all system components and software. Perform the tests and document all results under the supervision of the manufacturer's system engineer.

B. All operational scenarios, as defined by the customer planning guide, shall be tested to simulate the actual use of the system in the normal operating environment. The successful completion of these operational scenarios shall be documented.

3.5 SYSTEM DOCUMENTATION

A. Complete documentation shall be provided for the system. The documentation shall describe:

1. All operational parameters of the system.
2. Complete documentation of all programming and options.
3. Complete operating instructions for all hardware and software.

B. The following sections shall be provided in the system documentation:

1. System Administrator Manual: Provides an overview and a step-by-step guide and instructions detailing all system administrator responsibilities and functions.
2. User Manual: A step-by-step guide and instructions detailing all system user functions.

3. Technical Maintenance Manual: A comprehensive document providing all maintenance actions, system testing schedules, troubleshooting flowcharts, functional system layout, wiring diagrams, block diagrams, and schematic diagrams.

3.6 SYSTEM TRAINING

A. All labor and materials required for on-site system training by a certified representative of the system manufacturer shall be provided. Training shall be conducted at the project site using the project equipment.

B. Provide two weeks advanced notice of training to the Owner.

C. Provide a training outline agenda describing the subject matter and the recommended audience for each topic.

D. At a minimum, the following training shall be conducted:

1. System Administrators: A course detailing the system functions and operations. Provide configuration training on all aspects of the system.
2. Users: Provide a detailed course outlining the operational features of all aspects of the user interface. Topics shall include alarm monitoring functions, reports, error handling, alarm handling, output relay control, and general overview of the report hardware.
3. GUI Editing: Conduct detailed training on using the GUI editing software. Topics shall include the editing of existing graphical maps and the creation of new graphical maps.

E. Minimum on-site training times shall be:

1. System Administrators: Three (3) days.
2. Users: One (1) day.
3. GUI Editing: One (1) day.

NVMS Bid Inventory Form

Item	Cost/Other
Total fixed (lump sum cost) for the entire project:	
Itemize the total fixed lump sum cost as follows:	
Software cost for NVMS including all implementation services.	
Cost for all camera hardware and associated accessories.	
Itemize software cost for the following (show the math):	

Fixed, non-reoccurring flat base cost (if any)	
Fixed, non-reoccurring per-camera licensing fee (if any)	
Recurring flat base cost (if any - do NOT include optional software maintenance agreement costs)	
Recurring flat per-camera licensing fee (if any)	
Client workstation licensing fees (if any)	
Remote Client licensing fees (if any)	
Mobile Client licensing fees (if any)	
Itemize all other license fees not included above.	
Add all required and optional software maintenance agreement costs (do NOT include in bid cost).	
Acknowledge receipt of addenda by writing addendum number to the right.	_____ through _____ inclusive

Include below Server Acknowledgement Statement per Section 28 23 00, Article 2.3, Paragraph D.
List below all separate software options, licensing or other monetary features that the Integrator interprets as not being requested by this RFP, but that are available from the NVMS manufacturer for purchase. Attach separate document if needed.

END OF SECTION 28 23 00

SECTION 28 31 00 - FIRE ALARM AND DETECTION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fire alarm and detection systems.

1.2 RELATED WORK

A. Section 26 05 53 - Electrical Identification: Refer to electrical identification for color and identification labeling requirements.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in smoke detection and fire alarm systems with ten years' experience.

B. Installer: A factory-authorized Electrical or Security Contractor licensed with the State and local jurisdiction with five years' experience in the design, installation, and maintenance of fire alarm systems by that manufacturer.

C. Qualifications: The person managing/overseeing the preparation of shop drawings and the system installation/programming/testing shall be trained and certified by the system manufacturer and shall be Fire Alarm Certified by NICET, minimum Level 2. This person's name and certification number shall appear on the start-up and testing reports.

1.4 REFERENCES

A. NFPA 70 - National Electrical Code (NEC)

B. NFPA 72 - National Fire Alarm and Signaling Code

C. NFPA 101 - Life Safety Code

D. UL 2017 - General Purpose Signaling Devices and Systems

E. UL 217 / 268 - Standard for Smoke Alarms / Smoke Detectors for Fire Alarm Systems

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 26 05 00 and as noted below.

1. Failure to comply with all the following and all the provisions in 26 05 00 will result in the shop drawing submittal being rejected without review.
2. Failure to submit the fire alarm without all requirements fulfilled in a single comprehensive submittal will be grounds to require a complete resubmittal.

B. Provide product catalog data sheets as shop drawings.

1. Provide a product catalog data sheet for each item shown on the Electrical Symbols List and for each piece of equipment that is not shown on the drawings, but required for the operation of the system.
2. Where a particular Electrical Symbols List item has one or more variations (such as those denoted by subscripts, etc.) a separate additional product catalog data sheet shall be provided for each variation that requires a different part number to be ordered. The corresponding Electrical Symbols List symbol shall be shown on the top of each sheet.
3. Where multiple items and options are shown on one data sheet, the part number and options of the item to be used shall be clearly denoted.

C. Submit CAD Floor Plans as Shop Drawings:

1. The complete layout of the entire system, device addresses, auxiliary equipment, and manufacturer's wiring requirements shall be shown.
2. A legend or key shall be provided to show which symbols shown on the submittal floor plans correspond with symbols shown on the Contract Documents.

D. About all fire alarm circuits, provide the following: manufacturer's wiring requirements (manufacturer, type, size, etc.) and voltage drop calculations.

E. Provide installation and maintenance manuals under provisions of Section 26 05 00.

F. Submit manufacturer's certificate that system meets or exceeds specified requirements.

G. Provide information on the system batteries as follows: total battery capacity, total capacity used by all devices on this project, total available future capacity.

H. Submit photocopy proof of NICET certification of the person overseeing the preparation of drawings and installation/testing.

I. When required to comply with local or state regulatory reviews, the fire alarm submittal shall have a Professional Engineer's stamp and signature NICET Certification of the state in which the project is completed. NOTE: The Architect/Engineer cannot stamp and seal submittal drawings not prepared under their supervision.

1.6 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Provide quantity equal to 2 percent (2%) of amount of each type installed, but no less than two (2) units of each type.

a. Smoke and heat detectors, manual pull stations, duct smoke detectors, monitor modules, control modules and relays.
b. Notification Appliances: Speakers, speaker strobes, and strobes.

2. Keys: The installing contractor shall collect all equipment spare keys provided with each lockable or resettable device/cabinet minimum of one (1) set each and shall turn over to the Owner upon completion.
3. All spare parts shall be housed in metal cabinet labeled "Fire Alarm Spare Parts."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 26 05 00.

B. Store and protect products under provisions of Section 26 05 00.

1.8 REGULATORY REQUIREMENTS

A. System: UL or FM Global listed.

B. Conform to requirements of NFPA 101.

C. Conform to requirements of Americans with Disabilities Act (ADA).

D. Conform to UL 864 Fire Alarm, UL 1076 Security, UL2017 General Signaling, and UL 2572 Mass Notification Communications.

1.9 SYSTEM DESCRIPTION

A. Performance Statement: This specification section and the accompanying fire alarm specific design documents describe the minimum material quality, required features, and operational requirements of the system. These documents do not convey every wire that must be installed and every equipment connection that must be made. Based on the equipment described and the performance required of the system, as presented in these documents, the Vendor and the Contractor are solely responsible for determining all wiring, programming and miscellaneous equipment required for a complete and operational system.

B. This section of the specifications includes the furnishing, installation and connection of the microprocessor controlled, intelligent reporting, fire alarm equipment required to form a complete coordinated system that is ready for operation. It shall include, but is not limited to, alarm initiating devices, control panels, auxiliary control devices, annunciators, power supplies, and wiring as indicated on the drawings and specified herein.

C. Extending the Existing Edwards IO1000 Fire Alarm System: The existing control panel shall remain and shall be operational throughout construction. The system shall only be disabled to make new connections and to modify the programming. A fire watch shall be provided for all areas affected during outages. All system outages must be scheduled with the Owner at least one week prior. Individual devices may be disabled as needed based on construction activities to reduce the potential for false alarms, but all devices must be operational when the Contractor is not physically on site. New initiating devices may be connected to the existing signaling line circuits where capacity is available. Provide additional signaling line circuits as needed based on existing and new device quantity, including replacement of existing panel components. Provide new notification circuits to serve the new devices, including all necessary power supplies, amplifiers, batteries, and 120-volt input circuits. All new devices shall be programmed to provide the same sequence of operation as the existing devices of the same type, unless noted otherwise.

D. Fire Alarm System: NFPA 72; Automatic and manual fire alarm system, non-coded, analog-addressable with automatic sensitivity control of certain detectors, multiplexed signal transmission.

E. System Supervision: Provide electrically supervised system, with supervised Signal Line Circuit (SLC) and Notification Appliance Circuit (NAC). Occurrence of single ground or open condition in initiating or signaling circuit places circuit in TROUBLE mode. Component or power supply failure places system in TROUBLE mode.

F. Alarm Reset: Key-accessible RESET function resets alarm system out of ALARM if alarm initiating circuits have cleared.

G. Lamp Test: Manual LAMP TEST function causes alarm indication at each zone at fire alarm control panel and at annunciator panels.

H. Drawings: Only device layouts and some equipment have been shown on the contract drawings. Wiring and additional equipment to make a complete and functioning system has not been shown, but shall be submitted on the shop drawings.

1.10 PROJECT RECORD DOCUMENTS

A. Submit documents under the provisions of Section 26 05 00.

B. Include location of end-of-line devices.

C. Provide a CAD drawing of each area of the building (minimum scale of 1/16" = 1'-0") showing each device on the project and its address. The devices shall be shown in their installed location and shall be labeled with the same nomenclature as is used in the fire alarm panel programming.

D. Submit test results of sound pressure level (dBA) and intelligibility (STI) with the rooms tested designated on the floor plan. Notification devices shall have the tap wattage designated.

1.11 OPERATION AND MAINTENANCE DATA

A. Submit data under provisions of Section 26 05 00.

B. Include operating instructions, and maintenance and repair procedures.

C. Include results of testing of all devices and functions.

D. Include manufacturer's representative's letter stating that system is operational.

E. Include the CAD floor plan drawings.

F. Include shop drawings as reviewed by the Architect/Engineer and the local Authority Having Jurisdiction.

1.12 DOCUMENT STORAGE CABINET

A. The cabinet shall have all fire alarm system documents, including record drawings, wiring diagrams, operation manuals, etc. A legend sheet permanently attached to the door shall contain system passwords and inspection logs. The enclosure shall also provide two (2) key ring holders for system keys and a location for a standard size business card with service contact information.

B. The cabinet shall be red in color with an identification label reading "FIRE ALARM DOCUMENTS". Refer to Identification Section 26 05 53. The cabinet shall be lockable.

C. The final version of the system database program shall be stored within the cabinet.

D. Locate cabinet in the Mechanical Room.

1.13 WARRANTY

A. Provide one (1) year warranty on all materials and labor from Date of Substantial Completion.

B. Warranty requirements shall include furnishing and installing all software upgrades issued by the manufacturer during the one (1) year warranty period.

1.14 ANNUAL INSPECTION/TESTING AND SERVICE CONTRACT

A. Provide cost to furnish service, inspect, and test all devices of the fire alarm system per the requirement of NFPA for one (1) year, starting one year after the Date of Substantial Completion. Submit written reports of inspection testing per NFPA 72, Chapter 14.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Edwards

2.2 FIRE ALARM CONTROL PANEL (FAP)

A. Control Panel: Existing Edwards IO1000 panel.

B. Signal Line Circuit (SLC) and Notification Appliance Circuit (NAC) Boards:

1. Each board shall communicate directly with each addressable analog sensor and binary input to determine normal, alarm, or trouble conditions. Analog signals would be used for automatic test and determination of maintenance requirements.
2. Each board shall contain its own microprocessor and shall be provided to monitor addressable inputs and to control addressable outputs (addressable relays). The board shall communicate and provide power to all devices on its loop over a single pair of wires, except where 4-wire devices require a separate power circuit.

2.3 SIGNALING LINE CIRCUIT DEVICES

A. Combination Devices: Subscripts identify combination type devices when applicable. Contractor shall provide the combination device or provide multiple device(s) to meet the functionality when the manufacturer does not offer the required functionality with a single device.

B. Signal Line Device(s):

1. Subscripts: Subscripts are used to define the device type, installation, and identify the device with a specific sequence of operation.

a. Device type as follows:

1) W = Weather Proof
2) Candela Ratings:

a) ## = 15 Candela, 30 Candela; 75 Candela; 110 Candela; 177 Candela
b) CD = NICET designer shall select Candela rating as required to provide full coverage of the space.

C. FA-120; Smoke Detectors:

1. Analog Photoelectric Type Sensor: Shall use the photoelectric principle to measure smoke density and send data to the control panel representing the analog level of smoke density measured.
2. Each smoke detector shall connect directly to an SLC loop, unless listed as stand alone.
3. Each detector shall be mounted, where shown on the drawings, on a twist-lock base with all mounting hardware provided. Provide a two-piece head/base design.
4. Each detector shall have a manual switching means to set the internal identifying code (address) of that detector, which the control panel shall use to identify its address with the type of sensor connected.

5. Dual alarm and power indicators shall be provided that flash under normal conditions and remain continuous under alarm or trouble conditions. Remote indicator terminals shall be provided. Provide a remote LED indicator device if detector is not visible from a floor standing position.
6. A test means shall be provided to simulate an alarm condition.
7. Where operation is noted as required below 32°F and/or above 120°F, a conventional device shall be installed with a unique monitor module located in the nearest available location with maintained temperatures between 32°F and 120°F.

D. FA-122; Duct Smoke Detectors, Sampling Tube Type:

1. Subscripts are used to define the device type, installation, and identify the device with a specific sequence of operation.

    a. Duct-type smoke detectors shall use the same analog photoelectric sensor technology, with the same features specified for standard smoke detectors, except with additional features as specified below.
    b. Provide sampling tubes and mounting hardware to match the duct to which it is attached. Where the detector housing is larger than the duct height, Contractor shall fabricate a mounting bracket for the detector and attach according to the fire alarm manufacturer's recommendations.
    c. Provide a remote alarm LED indicator device (FA-241) or (FA-242) if detector is not visible from a floor-standing position. If detector is located above a suspended ceiling, mount remote indicator in ceiling directly below detector with a white single-gang faceplate labeled: Duct Smoke Detector.

E. FA-130; Manual Pull Stations:

1. Manual pull station, addressable, single action with plastic breakrod, reset key lock, semi-flush mount, red high abuse plastic or cast metal construction with white lettering. Provided with all necessary mounting hardware.
2. Manual stations shall connect directly to an SLC loop. Stations shall provide address setting means using rotary decimal or DIP switches.
3. Where operation is noted as required below 32°F and/or above 120°F, a conventional device shall be installed with a unique monitor module located in the nearest available location, with maintained temperatures between 32°F and 120°F.

F. FA-140; Heat Detectors:

1. Combination rate of rise and 135°F fixed temperature analog thermal type sensor. Factory programmed to alarm at 135°F and at 15°F per minute rate-of-rise. Sensor shall measure heat level and send data to the control panel representing the analog level of thermal measurement and rate-of-rise.
2. Provide a two-piece head/base design, with a manual switching means to set the internal identifying code (address) of that detector, which the control panel shall use to identify its address with the type of sensor connected.
3. Heat detectors shall connect directly to SLC loops. Where fixed temperature or explosion proof detectors are used, one monitor module may be used to monitor all detectors in one room/area as shown on the drawings.

4. Detectors shall be mounted, where shown on the drawings, on a twist-lock base with all mounting hardware provided.
5. Provide a remote LED indicator device if detector is not visible from a floor-standing position.
6. Dual alarm and power indicators shall be provided that flash under normal conditions and remain continuous under alarm or trouble conditions. A connection for attachment of a remote indicator shall be provided.
7. A test means shall be provided to simulate an alarm condition.
8. Where operation is noted as required below 32°F and/or above 120°F, a conventional device shall be installed with a unique monitor module located in the nearest available location with maintained temperatures between 32°F and 120°F.

G. FA-160; Monitor Modules:

1. Subscripts are used to define the device type, installation, and identify the device with a specific sequence of operation.

    a. Device types as follows:

        1) Blank = Refer to Plans
        2) KB = Knox Box Monitor

2. Monitor Module shall connect directly to an SLC loop and receive power from a separate 24 VDC circuit. It shall interface initiating devices with the control panel using Style D or Style B circuits. Contractor Option: Use an interface module (2-wire operation) for Style B circuits connected to normally-open dry contacts, such as a flow switch.
3. The module shall be mounted in an enclosure located in an accessible service location as near as possible to the device(s) being monitored, or where shown on the drawings. All mounting hardware shall be provided.
4. The module shall supply the required power to operate the monitored device(s).
5. The module shall provide address setting means using rotary decimal or DIP switches.

H. FA-161; Addressable Control Module:

1. Subscripts are used to define the device type, installation, and identify the device with a specific sequence of operation

    a. Device types as follows:

        1) Blank = Refer to Plans
        2) DH = Door Hold Open
        3) PD = Hold Open Override

2. Relay that represents an addressable control point used primarily for the control of auxiliary devices as indicated on the drawings. Contractor to provide additional child relay(s), as required, rated for the electrical load being controlled (Contractor to match voltage, amps, etc.).

3. Relay shall connect directly to an SLC loop and receive power from a separate 24 VDC circuit.
4. The relay shall be mounted in an enclosure located in an accessible service location as near as possible to the device(s) being controlled, unless otherwise shown on the drawings. All mounting hardware shall be provided.
5. The relay shall supply 24 VDC power to the device(s) being controlled, unless otherwise indicated on the drawings.

2.4 NOTIFICATION APPLIANCE DEVICES

A. Combination Devices: Subscripts identify combination type devices when applicable. Contractor shall provide the combination device or provide multiple device(s) to meet the functionality when the manufacturer does not offer the required functionality with a single device.

B. Notification Appliance Device(s):

1. Subscripts: Subscripts are used to define the device type, installation, and identify the device with a specific sequence of operation.

a. Device types as follows:

1) W = Weather Proof
2) WG = Wire guard is required
3) Candela Ratings:

a) ## = 15 Candela; 30 Candela; 75 Candela; 110 Candela; 177 Candela
b) CD = NICET designer shall select Candela rating as required to provide full coverage of the space.

C. Notification Device(s):

1. Wall Mounted: Red housing with white lettering or pictogram.
2. Ceiling Mounted: Red housing with white lettering or pictogram.

D. FA-200; Visual Alarm Devices:

1. Wall or ceiling mounted, refer to plans.
2. High intensity (Candela rating as scheduled on the drawings) xenon strobe or equivalent under a lens. Candela rating shall be visible from exterior of the device.
3. The maximum pulse duration shall be 0.2 seconds with a maximum duty cycle of 40%. The flash rate shall be 1 Hz. Where more than two strobes are visible from any one location, the fire alarm visual devices shall be synchronized.
4. Device, housing, and backbox shall be UL listed for fire alarm/emergency applications.
5. (W) Weatherproof Visual Notification Device: High intensity strobe, square housing, 75 Candela rating, suitable for wet locations. Provide with weatherproof back box.

a. Mounting: Semi-flush wall.
b. Conduit shall not be exposed.

E. FA-210; Audio Horn Alarm Devices:

1. Subscripts are used to define the device type, installation, and identify the device with a specific sequence of operation.
2. Wall or ceiling mounted, refer to plans.
3. Sound Rating: 85 dB at 10 feet. Sound levels for alarm signals shall not exceed 120 dBA in the occupied area.
4. Device shall be capable of a high and low dB level setting. Unless noted otherwise, the device shall be set to the high setting at building completion.
5. Device, housing, and backbox shall be UL listed for fire alarm/emergency applications.

F. FA-211; Combination Audio Horn and Visual Alarm Device:

1. Wall or ceiling mounted, refer to plans.
2. Combine audio and visual components into a single device. Refer to the corresponding paragraphs above for requirements of each component.
3. (W) Weatherproof Audio/Visual Notification Device: Electronic horn with high intensity strobe, square housing, 75 Candela, suitable for wet locations. Provide with weatherproof back box.

a. Mounting: Semi-flush wall.
b. Conduit shall not be exposed.

2.5 NOTIFICATION APPLIANCE CIRCUIT PANEL (NAC)

A. As shown on the plans or as a Contractor's option if not shown, furnish and install NAC extender panels as necessary to provide remote power supply for notification appliance circuits (NAC). Contractor shall indicate quantity and locations of each NAC on the shop drawing submittals.

B. Each NAC shall be self-contained remote power supply with batteries, and battery charger mounted in a surface lockable cabinet. Battery capacity shall be sufficient for operation for 24 hours in a non-alarm state followed by alarm for 15 minutes, plus 25% spare capacity for future devices. Each NAC provides a minimum of up to 4 outputs, 2A continuous, or 6A full load total capacity.

C. Power for each NAC shall be from a local 120 VAC emergency circuit. Provide two #12 conductors and one #12 ground in 1/2" conduit to each NAC from a dedicated 20A/1P circuit breaker with a red handle and a manufacturer's standard handle lock-on device. Coordinate panel and circuit number with the Architect/Engineer prior to installation.

D. NAC extender panels may be installed only where shown on drawings.

E. Mounting: Surface.

2.6 ANNUNCIATION

A. FAA; Remote LCD Annunciators:

1. Auxiliary annunciators shall indicate alarm and trouble conditions visually and audibly as shown on the drawings. Provide local TROUBLE ACKNOWLEDGE, TEST, and ALARM SILENCE capability. Minimum 80-character display.
2. Communications and power to the annunciators shall be supervised. The annunciator shall receive power from the fire alarm control panel.
3. A single key switch shall enable all switches on the annunciator.
4. Mounting: Flush.

B. FA-241; Fire Alarm Remote Indicator:

1. Red LED type.
2. Mounts flush to a single gang box.

C. FA-242; Fire Alarm Remote Indicator and Test Switch:

1. Red LED type.
2. Key switch test selector.
3. Mounts flush to a single gang box.

2.7 CONNECTIONS TO AUXILIARY DEVICES PROVIDED BY OTHERS

A. FA-260; Flow Switch:

1. (FA-260) Connection to flow switch to monitor fire protection flow switch or discharge output contacts. Normally open dry contacts for fire alarm interface. Furnished and installed by MC; wired by EC.
2. Provide a dedicated monitor switch for each sprinkler flow switch.

B. FA-261; Tamper / Monitor Switch:

1. (FA-261) Connection to monitor switch to monitor fire protection system supervisory switches or output contacts. Normally open dry contacts for fire alarm interface. Furnished and installed by MC; wired by EC.
2. Tamper switches in the same room or system may be monitored by a single monitor switch when shown grouped on the plans.
3. Subscripts: Subscripts are used to define the device type, installation, and identify the device with a specific sequence of operation.
4. Device types as follows:

    a. Blank = Refer to Plans
    b. PIV = Post Indicator Valve

5. (PIV) Post Indicator Valve. Connection to post indicator valve for sprinkler system supervisory notification. Normally open dry contacts for fire alarm interface. Furnished and installed by MC; wired by EC. Provide surge protection device as recommended by the fire alarm system manufacturer on line entering/leaving the facility.

2.8 WIRING

A. Fire alarm wiring/cabling shall be furnished and installed by the Contractor in accordance with the manufacturer's recommendations and pursuant to National Fire Codes. Cabling shall be UL listed and labeled as complying with the Electrical Code for power-limited fire alarm signal service.

B. Fire Alarm Cable:

1. Manufacturers:

a. Comtran Corp.
b. Helix/HiTemp Cables, Inc.
c. Rockbestos-Suprenant Cable Corp.
d. West Penn Wire/CDT.
e. Radix.

PART 3 - EXECUTION

3.1 SEQUENCES OF FIRE ALARM OPERATION

A. General:

1. Refer to the Fire Alarm Operation Matrix on the drawings for basic requirements and system operation.
2. All system output programs assigned via control-by-event equations to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.

B. Panel/Annunciator Alarm, Trouble, Supervisory Indication:

1. Appropriate system Alarm, Trouble, or Supervisory LED shall flash at the control panel, transponder, and annunciator locations.
2. A local signal in the control panel shall sound.
3. The LCD display shall indicate all information associated with the condition, including the name of the item, type of device and its location within the protected premises.
4. history storage equipment shall log the information associated with the fire alarm control panel (FAP) condition, along with the time and date.
5. Transmit the appropriate signal (supervisory, trouble, alarm) to the central station via the digital communicator.

C. Audible Alarms Sequence:

1. Audible alarms throughout the building shall sound.

D. Visual Alarms Sequence:

1. Visual alarms throughout the building shall flash.

E. Fire Protection Electric Sprinkler Strobe Sequence:

1. The fire alarm shall utilize an addressable relay to energize the electric sprinkler strobe upon activation of the flow switch.

F. AHU and Mechanical Fan Shutdown Sequence:

1. The fire alarm system shall utilize addressable relays to de-energize all AHU motor controllers and mechanical fans. Coordinate other requirements with HVAC installer.
2. The fire alarm system shall directly shut down the AHU or mechanical fan through the local HVAC control device (i.e., variable frequency drive or motor starter).
3. Where a facility has more than one AHU or mechanical fan, each shall be shutdown individually based on input from initiation devices in the area served by the unit or designated for each air distribution system.

G. Access Control Override Sequence:

1. The fire alarm shall use addressable output relay(s) to signal the access control panel.
2. Refer to the access control specifications for requirement upon fire alarm signal. The fire alarm shall initiate an override of delayed egress doors.

3.2 INSTALLATION

A. Install system in accordance with manufacturer's instructions and referenced codes.

B. Devices:

1. General:

a. All ceiling-mounted devices shall be located where shown on the reflected ceiling and floor plans. If not shown on the reflected ceiling or reflected floor drawings, the devices shall be installed in the relative locations shown on the floor drawings in a neat and uniform pattern.
b. All devices shall be coordinated with luminaires, diffusers, sprinkler heads, piping and other obstructions to maintain a neat and operable installation. Mounting locations and spacing shall not exceed the requirements of NFPA 72.
c. Where the devices are to be installed in a grid type ceiling system, the detectors shall be centered in the ceiling tile.
d. The location of all fire alarm devices shall be coordinated with other devices mounted in the proximity. Where a conflict arises with other items or with architectural elements that will not allow the device to be mounted at the location or height shown, the Contractor shall notify the Architect/Engineer to coordinate a different acceptable location.

2. Per the requirements of NFPA, detector heads shall not be installed until after the final construction cleaning unless required by the local Authority Having Jurisdiction (AHJ). If detector heads must be installed prior to final cleaning (for partial occupancy, to monitor finished areas or as otherwise required by the AHJ), they shall not be installed until after the fire alarm panel is installed, with wires terminated, ready for operation. Any detector head installed prior to the final construction cleaning shall be removed and cleaned prior to closeout.
3. Protection of Fire Alarm System:

    a. A smoke detector shall be installed within the vicinity of the main fire alarm panel and every NAC extender panel per NFPA 72. A heat detector may be substituted when a smoke detector is not appropriate for the environment of installation.

4. In-Duct Analog Smoke Detectors:

    a. In-duct analog smoke detectors shall be installed in the duct where shown on the drawings and details. The devices shall be installed in the respective duct at the approximate location where shown on the electrical drawings to meet the operation requirements of the system.
    b. All detectors shall be accessible.

5. Manual Pull Stations:

    a. Stations shall be located where shown and at the height noted on the drawings.

6. Addressable Relays and Monitor Modules:

    a. Modules shall be located as near to the respective monitor or control devices as possible, unless otherwise indicated on the drawings.
    b. All modules shall be mounted in or on a junction box in an accessible location.
    c. Where not visible from a floor standing position, a remote indicator shall be installed to allow inspection of the device status from a local floor standing location.

7. SLC Loop Isolation Modules:

    a. Isolation modules shall be installed to limit the number of addressable devices that are incapacitated by a circuit fault.
    b. Install all Isolation Modules within the fire alarm control panel, unless otherwise indicated on the drawings. Refer to the fire alarm riser diagram for requirements. Refer to the floor plans for areas served by separate isolation modules.

8. Notification Appliance Devices:

    a. Devices shall be located where shown on the drawings.
    b. Wall-mounted audio, visual and audio/visual alarm devices shall be mounted as denoted on the drawings.

c. Where ceiling mounted visual alarm devices or combination audio/visual alarm devices are shown where the ceiling is greater than 30'-0" high, they shall be stem mounted so that the entire unit is below 30'-0". This does not apply to audio-only alarm devices.

C. Annunciators:

1. Remote Annunciators: The annunciators shall be located where shown on the drawings and approved by the fire marshal.

D. Wiring:

1. Fire alarm wiring/cabling shall be provided by the Contractor in accordance with the manufacturer's recommendations and pursuant to National Fire Codes.
2. Refer to Identification Section 26 05 13 for color and identification requirements.
3. All junction boxes with SLC and NAC circuits shall be identified on cover. Refer to Identification Section 26 05 13 for color and identification requirements.
4. Fire Alarm Power Branch Circuits: Building wiring as specified in Section 26 05 13.
5. Notification Appliance Circuits shall provide the features listed below. These requirements may require separate circuits for visual and audible devices.

    a. Fire alarm temporal audible notification for all audio appliances.
    b. Synchronization of all visual devices where two or more devices are visible from the same location.
    c. Ability to silence audible alarm while maintaining visual device operation.
    d. Emergency communication alert and textual visible appliance notification.

6. Signal line circuits connecting devices shall not span floors or 2-hour smoke compartments.
7. Signal line circuits connecting devices shall be provided with an isolation module at each floor separation or as otherwise shown on the drawings.
8. No wiring other than that directly associated with fire alarm detection, alarm or auxiliary fire protection functions shall be in fire alarm conduits. Wiring splices shall be avoided to the extent possible, and if needed, they shall be made only in junction boxes, and enclosed by plastic wire nut type connectors. Transposing or changing color coding of wires shall not be permitted. All conductors in conduit containing more than one wire shall be labeled on each end, in all junction boxes, and at each device with "E-Z Markers" or equivalent. Conductors in cabinets shall be carefully formed and harnessed so that each drops off directly opposite to its terminal. Cabinet terminals shall be numbered and coded, and no unterminated conductors are permitted in cabinets or control panels. All controls, function switches, etc. shall be clearly labeled on all equipment panels.

E. Fire Alarm Cabling Color Code: Provide circuit conductors with insulation color coding as follows, or using colored tape at each conductor termination and in each junction box.

1. Power Branch Circuit Conductors: In accordance with Section 26 05 53.
2. Signaling Line Circuit: Overall red jacket with black and red conductors.
3. DC Power Supply Circuit: Overall red jacket with violet and brown conductors.

4. Notification Appliance Circuit: Overall red jacket with blue and white conductors.
5. Door Release Circuit: Gray conductors.
6. Central Station Trip Circuit: Orange conductors.
7. Central Station Fire Alarm Loop: Black and white conductors.

F. Devices surface mounted in finished areas shall be mounted on surface backboxes furnished by fire alarm equipment supplier. Backboxes shall be painted to match device, shall be the same shape and size as the device shall not have visible knockouts.

G. Make conduit and wiring connections to door release devices, sprinkler flow and pressure switches, sprinkler valve monitor switches, fire suppression system control panels, duct analog smoke detectors and all other system devices shown or noted on the Contract Documents or required in the manufacturer's product data and shop drawings.

3.3 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 26 05 00.

B. Test in accordance with NFPA 72, Chapter 14 and local fire department requirements. Submit documentation with O & M manuals in accordance with Section 14.6 of the Code.

C. Contractor shall test and adjust the fire alarm system as follows:

1. Speaker taps shall be adjusted to the lowest tap setting which achieves a sound level higher than or equal to the greatest of the following:

    a. 70dBA.
    b. 15 dBA above ambient levels as indicated in NFPA 72 Table A.18.4.3.
    c. 15 dBA above measured ambient. 5 dBA above the maximum measured sound level with duration of more than 60 seconds.
    d. As specified on the drawings.

2. Sound level measurement procedure shall meet the following requirements:

    a. All measurements shall use the 'A' weighted, dBA, sound measurement scale.
    b. All measurements shall be taken after furnishings, wall coverings and floor coverings are in place.
    c. All measurements shall be taken after fixed equipment (HVAC units, etc.) producing ambient noise is installed and is in operation.
    d. Final ambient sound measurements shall be taken during occupancy and the units shall be re-adjusted at that time, if necessary.
    e. All sound level measurements shall be taken at a height of 5' above the finished floor level.

f. Measurements shall be taken in every unique room. If there are multiple rooms, which have the identical dimensions and function, 10%, or a minimum of two (2) rooms shall be tested. The results from the rooms tested shall be averaged and the remaining rooms may be adjusted per the average.
g. Measurements shall be taken on a 20' x 20' grid and the results for all points taken shall be averaged. If the room is smaller than 20' x 20' a minimum of two measurements are required.
h. Measurements shall be taken halfway between speakers or halfway between a speaker and the wall. No measurements shall be taken at the extreme edges of the room, nor directly under speakers.

3.4 MANUFACTURER'S FIELD SERVICES

A. Provide manufacturer's field services under provisions of Section 26 05 00.

B. Include services of the manufacturer's software programmer to write initial custom-user program (for Color Graphics Annunciation System).

C. Include services of certified technician to supervise installation, adjustments, final connections, and system testing.

D. Note that room numbers depicted on the architectural/engineering drawings will not necessarily reflect the actual room (signage) numbers that the Owner selects. Contractor and fire alarm manufacturer shall coordinate the actual room numbers as the Owner directs to identify each device. This list shall be a part of the floor plan record drawing to be turned in at the project closeout.

E. Include the services to train up to three of the Owner's staff in operation, maintenance, and programming of the fire alarm system at the manufacturer's factory. Airfare and lodging expenses for the Owner's staff will be by the Owner.

F. System Occupancy Adjustments: When requested by Owner within 12 months of date of Substantial Completion, provide on-site system adjustments to suit actual occupied conditions. For this purpose, provide up to two (2) site visits, four (4) hours each visit, outside normal occupancy hours.

3.5 SYSTEM TRAINING

A. System training shall be performed under provisions of Section 26 05 00.

B. Minimum on-site training times shall be:

1. System Operators: One (1) day.

END OF SECTION 28 31 00

SECTION 32 31 00 – HIGH-SECURITY CANTILEVER GATES

1. GENERAL

1.1 WORK INCLUDES

1. Contractor provide all labor, materials, and appurtenances necessary for installation of the high-security cantilever gate system defined herein.

B. Related Requirements:

1. Section 32 31 19 "High Security Anti-Scale Fence."

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1. Review methods and procedures related to high-security cantilever gates including, but not limited to, the following:

a. Schedules and coordination requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, power requirements, motors, actuation controls, access control system integration components, and finishes for all components.

1.4 REFERENCES

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.

C. ASTM B221 – Aluminum and Aluminum Alloy Extruded Bars, Shapes and Tubes

D. ASTM D523 - Test Method for Specular Gloss.

E. ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.

F. ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

G. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

H. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

I. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

J. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Provide all maintenance manuals.

1.7 COORDINATION

A. Coordinate this work with work by all other trades.

1.8 PRODUCT HANDLING AND STORAGE

A. Upon receipt, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace all structural fence components shall be warranted within specified limitations, by the manufacturer.

1. Warranty Period: Fifteen years from date of Substantial Completion.

2. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufacturer’s warranty shall be guaranteed for five (5) years from date of Substantial Completion.

2. PRODUCTS

2.1 MANUFACTURER

A. Basis-of-design manufacturer and product; Ameristar by ASSA Abloy Impasse Security cantilever Traverse IS Anti-Scale® gate system, Gauntlet design, manufactured by Ameristar Perimeter Security USA Inc., in Tulsa, Oklahoma. The system shall include all components including, but not limited to, pales, rails, posts, gates, operators, motors, connection to access control systems, and hardware required to provide a complete system.

B. Substitutions allowed, subject to compliance with requirements.
   1. Division 01 submittal requirements apply.

2.2 MATERIAL

A. The materials used for gate framing (uprights & diagonal bracing) shall be manufactured from ASTM A653 Steel with yield strength of 34,800 PSI, a tensile strength of 37,700PSI and a standard mill finish. The aluminum extrusions for top and bottom enclosed tracks shall be alloy and temper designation 6005-T5 to meet ASTM B221.

B. Material for pales shall be 2.75” x 1/8” wall aluminum. Pales for Anti-Scale shall have an airspace of 1.375 inches.

C. Material for gate uprights shall be 2 1/2” X 16 ga. and diagonal bracing shall be 2” square x 16 ga. steel. The cross-sectional shape of the enclosed-track shall confirm to the manufacturers standard design with a single extrusion consisting of a 3.75” x 7” channeled support with integrated 3” x 3” enclosed-track raceway. Gates shall be constructed using a single-track system.

D. Steel material for fence posts shall be galvanized prior to forming in accordance with the requirements of ASTM A653/A653M, with minimum yield strength of 45,000 psi (310 MPa). The steel shall be hot-dip galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/ft^2 (276 g/m^2), Coating Designation G-90. Depending on application and gate size, material for gate support posts shall be 4” x 11 Ga., or 6” x 3/16”.

E. Support carriage trolly assemblies, for the gates enclosed bottom track, shall have two mounting options: concrete slab or post mount bracket configuration, and shall support the vertical load of the gate. The gates center of gravity shall be centered on the bottom support carriage trolly assemblies. Installation of the carriage trolly assemblies shall be per manufacturer’s written installation instructions.

2.3 FABRICATION

A. Gate frame uprights and diagonal bracing shall be prefabricated and pre-punched to accept frame fasteners. Enclosed track shall be pre-punched to accept gate uprights.

Pales shall be precut to specified length and predrilled to accept pale to track fasteners. Posts shall be precut to specified lengths.

B. Top and bottom enclosed track extrusions shall be mechanically fastened to vertical gate uprights and intermediate supports, as required by assembly instructions. Diagonal bracing shall be mechanically fastened to vertical gate uprights and intermediate supports, as required by assembly instructions. Pales shall be mechanically fastened to top and bottom enclosed track, as required by assembly instructions.

C. The manufactured gate components shall be subjected to the manufacturer's thermal stratification coating process (high-temperature, in-line, multi-stage, and multi-layer) including, as a minimum, a six-stage pretreatment/wash and an electrostatic spray application of a polyester finish. The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The color shall be the manufacturer's standard Dark Bronze. The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic as follows**.**
   1. Coating Performance Requirements
      a. Adhesion: ASTM D3359 – Method B.
         1) Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
      b. Corrosion Resistance: ASTM B117, D714, and D1654chart
         1) Corrosion Resistance over 1,000 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
      c. Impact Resistance: ASTM D2794
         1) Impact Resistance over 60-inch lb. (Forward impact using 0.625" ball).
      d. Weathering Resistance: ASTM D822, D2244, D523 (60 deg. Method)
         1) Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

3. EXECUTION

3.1 PREPARATION

A. All new installation shall be laid out by the contractor in accordance with the construction plans and manufacturer's written recommendations.

3.2 INSTALLATION

A. Cantilever support posts shall be set in concrete footers having a minimum depth of 48". Posts shall be spaced according to gate specific submittal drawings. Provide a manufacturer's standard Safety Kit for automated gates. Reference Division 03 - Concrete for concrete requirements for all footings.

B. Gate to be installed per manufacturers written gate installation instructions. For automated gates, the Contractor shall provide all gate installation, components, and assembly according to ASTM F2200 and UL325 Standards.

C. When cutting/drilling posts adhere to the following steps to seal the exposed steel surfaces.
   1. Remove all metal shavings from the cut area.
   2. Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry.
   3. Apply 2 coats of manufacturer's custom finish paint matching fence color.
   4. Manufacturer's spray cans or paint pens shall be used to prime and finish exposed surfaces; prevent overspray.

D. Gate posts shall be spaced according to the manufacturers' drawings, depending upon clear opening. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacturer of the gate and shall be installed per manufacturer's recommendations.

3.3 CLEANING

A. Contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

END OF SECTION 32 31 00

SECTION 32 31 19 – HIGH-SECURITY ANTI-SCALE FENCE

1. GENERAL

1.1 WORK INCLUDES

1. Contractor provide all labor, materials, and appurtenances necessary for installation of the high-security anti-scale fence system defined herein.

B. Related Requirements:

1. Section 32 31 00 "High Security Cantilever Gates."

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1. Review methods and procedures related to high-security anti-scale fence including, but not limited to, the following:

a. Schedules and coordination requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, power requirements, motors, actuation controls, access control system integration components, and finishes for all components.

1.4 REFERENCES

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.

C. ASTM D523 - Test Method for Specular Gloss.

D. ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.

E. ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

F. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

G. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

H. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

I. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.

J. ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Provide all maintenance manuals.

1.7 COORDINATION

A. Coordinate this work with work by all other trades.

1.8 PRODUCT HANDLING AND STORAGE

A. Upon receipt, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace all structural fence components shall be warranted within specified limitations, by the manufacturer.

1. Warranty Period: Fifteen years from date of Substantial Completion.

2. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufacturer’s warranty shall be guaranteed for five (5) years from date of Substantial Completion.

2. PRODUCTS

2.1 MANUFACTURER

A. Basis-of-design manufacturer and product; Ameristar by ASSA Abloy Impasse II Anti-Scale® fence system, Gauntlet design, manufactured by Ameristar Perimeter Security USA Inc., in Tulsa, Oklahoma. The system shall include all components including, but not limited to, pales, rails, posts, gates, and hardware required to provide a complete system.

B. Substitutions allowed, subject to compliance with requirements.
   1. Division 01 submittal requirements apply.

2.2 MATERIAL

A. Steel material for all fence framework when galvanized prior to forming, shall conform to the requirements of ASTM A924/A924M, with a minimum yield strength of 45,000 psi (310 MPa). The steel shall be hot-dip galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/sq. ft· (276 g/sq. m.), Coating Designation G-90.

B. Material for corrugated pales shall be a nominal 2.75” x .75” x 14 Ga. The cross-sectional shape of the rails shall conform to the manufacturer's Impasse II® or approved equal rail design a nominal 2” x 2” x 11 Ga. Pre-drilled holes in the Impasse II® or approved equal rail shall be spaced 4-3/16” on center, providing a pale airspace of no greater than 1-1/2” (38mm). Tamperproof fasteners shall be used to fasten each pale to rail at every intersection. Posts shall conform to the manufacturer's Impasse II® or approved equal I-Beam design with a nominal 3” x 2.75” x 12 Ga. Fence posts and gate posts shall meet the minimum size requirements as follows.
   1. Fence Posts: 4” x 1-3/4”x 0.100” I-beam.
   2. Gate Posts: 4” x 11 Gauge.

2.3 FABRICATION

A. Pales, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept tamperproof security fasteners. Post flange shall be pre-punched to accept rail to post attachment. Post web shall be punched providing a clear opening for interior of rails to align throughout the entire system for affixing conduit, video cabling, IDS wiring, and other components for a complete systems integration. All rails shall be attached to post flange providing a bracket-less design at each intermediate post to provide an anti-climb condition.

B. Completed panels shall be capable of supporting a 400 lb. load (applied at midspan) without permanent deformation. Panels shall be biasable to a 30˚ change in grade.

C. The manufactured gate components shall be subjected to the manufacturer’s thermal stratification coating process (high-temperature, in-line, multi-stage, and multi-layer) including, as a minimum, a six-stage pretreatment/wash and an electrostatic spray

application of a polyester finish. The topcoat shall be a “no-mar” TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The color shall be the manufacturer’s standard Dark Bronze. The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic as follows**.**

1. Coating Performance Requirements
    a. Adhesion: ASTM D3359 – Method B.
        1) Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
    b. Corrosion Resistance: ASTM B117, D714, and D1654
        1) Corrosion Resistance over 1,000 hours (Scribed per D1654; failure mode is accumulation of 1/8” coating loss from scribe or medium #8 blisters).
    c. Impact Resistance: ASTM D2794
        1) Impact Resistance over 60-inch lb. (Forward impact using 0.625” ball).
    d. Weathering Resistance: ASTM D822, D2244, D523 (60 deg. Method)
        1) Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

3. EXECUTION

3.1 PREPARATION

A. All new installation shall be laid out by the contractor in accordance with the construction plans and manufacturer’s written recommendations.

3.2 INSTALLATION

A. Cantilever support posts shall be set in concrete footers having a minimum depth of 48”. Posts shall be spaced according to gate specific submittal drawings. Provide a manufacturer’s standard Safety Kit for automated gates. Reference Division 03 - Concrete for concrete requirements for all footings.

B. Gate to be installed per manufacturers written gate installation instructions. For automated gates, the Contractor shall provide all gate installation, components, and assembly according to ASTM F2200 and UL325 Standards.

C. When cutting/drilling posts adhere to the following steps to seal the exposed steel surfaces.
    1. Remove all metal shavings from the cut area.
    2. Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry.
    3. Apply 2 coats of manufacturer’s custom finish paint matching fence color.
    4. Manufacturer’s spray cans or paint pens shall be used to prime and finish exposed surfaces; prevent overspray.

D. Gate posts shall be spaced according to the manufacturers’ drawings, depending upon clear opening. The manufacturers’ gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacturer of the gate and shall be installed per manufacturer’s recommendations.

3.3 CLEANING

A. Contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

END OF SECTION 32 31 19