CHAMPAIGN COUNTY BOARD
FACILITIES COMMITTEE AGENDA
County of Champaign, Urbana, Illinois
Tuesday, September 6, 2022, at 6:30p.m.
Shields-Carter Meeting Room
Brookens Administrative Center
1776 E. Washington St., Urbana, IL 61802

Committee Members:

Steve Summers – Chair	Emily Rodriguez
Stan Harper – Vice Chair	Leah Taylor
Jim Goss	
Bethany Vanichtheeranont	
Jenny Lokshin	Jodi Wolken

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A. Semi-annual Review of CLOSED Session Minutes

VIII. Presiding Officer's Report

A. Future Meeting – **Tuesday, October 4, 2022** @ 6:30pm

IX. Designation of Items to be Placed on the Consent Agenda

X. Adjournment

All meetings are at Brookens Administrative Center – 1776 E Washington Street in Urbana – unless otherwise noted. To enter Brookens after 4:30 p.m., enter at the north (rear) entrance located off Lierman Avenue. Champaign County will generally, upon request, provide appropriate aids and services leading to effective communication for qualified persons with disabilities. Please contact Administrative Services, 217-384-3776, as soon as possible but no later than 48 hours before the scheduled meeting.

CHAMPAIGN COUNTY BOARD
FACILITIES COMMITTEE
County of Champaign, Urbana, Illinois

MINUTES – Pending Approval

DATE: Tuesday August 2, 2022
TIME: 6:30 p.m.
PLACE: Lyle Shields Meeting Room
Brookens Administrative Center, 1776 E. Washington St., Urbana IL 61802

Committee Members

Present: Steve Summers, Jodi Wolken, Jenny Lokshin, Stan Harper, Leah Taylor, Bethany Vanichtheeranont, Jim Goss

Absent: Emily Rodriguez

County Staff: Dana Brenner (Facilities Director), Chris Smith (Building and Grounds Manager), Darlene Kloeppel (County Executive), Aaron Esry (County Board Member), Dustin Heuerman (Sheriff), Karee Voges (Corrections Captain), Dan Busey (Recording Clerk)

Others Present: Chris Bieser (Reifsteck Reid Architecture), Karla Smalley (Bailey Edward Architecture)

Agenda

I. Call to Order and Roll Call
Committee Chair Summers called the meeting to order at 6:31 P.M.

II. Approval of Agenda/Addenda
Moved by Ms. Wolken to approve the agenda; seconded by Ms. Lokshin. Upon Voice Vote, the **Motion Carried Unanimously.**

III. Approval of Minutes – June 7, 2022
Moved by Ms. Taylor to approve the minutes from June 7, 2022; seconded by Ms. Wolken. Upon Voice Vote, the **Motion Carried Unanimously.**

IV. Public Participation
None.

V. Communications
None.

VI. New Business

A. Update on ITB#2021-003 Satellite Jail HVAC Replacement. Mr. Brenner, Facilities Director, gave an update on the project. Essentially all the work that can be done has been done at this time. The project now is on hold until the air handlers arrive on site.

Three of the four air handler's delivery status is still uncertain currently. Davis-Houk and GHR have continued to contact the manufacturer (Carrier) weekly to attempt to speed up the delivery date.

B. Update on emergency purchase and installation of new chiller at ILEAS. Chris Smith, Buildings and Grounds Manager, delivered the update. ENTEC was called out to look at the down chiller at ILEAS back in first part of May. The chiller had an electrical component fail that controls the compressors for the chiller. Options for repairing that component after ENTEC's diagnosed Were: spending $63,000 dollars to repair the component, however, the replacement parts for parts necessary repair will take 231 days out from the date ordered or purchase a full replacement chiller for $243,000. At that time ENTEC was informed by Carrier that a chiller from their North Carolina plant could be delivered in June. An emergency PO was sent to ENTEC on May 18th for the purchase. Since that time the chiller arrival date has been moved to the latter part of July, and now we to late August. Mr. Brenner has been calling ENTEC regularly to inquire on the whereabouts of said chiller with no solid answers. Yesterday we received an email from ENTEC basically stating that they are not getting any answers from the higher ups in the Carrier factory on the status or a delivery time for the chiller. Meanwhile the employees at ILEAS have acquired some portable units that Physical Plant has assisted in installing and maintaining to ease the pain of the heat in the building. We are trying to be optimistic that this chiller will show up soon.

C. Update on Satellite Jail Consolidation Design Development and Budget Discussion - Reifsteck Reid Architecture – Chris Bieser delivered the update. Mr. Bieser delivered information based on fifty percent of construction documents. Material prices in some cases have tripled since the original price estimate, which was forecast a year ago. Mr. Brenner went over the amounts that were approved by the County Board and how they would be procured. Captain Voges has met with Department of Corrections Inspector recently and reported that they were very pleased with the plans. However, the inspector mentioned that D.O.C. continually change and that an indoor/outdoor recreation space could become the standard. Mr. Bieser stated that it would be around 1.4 million to enclose the current outdoor recreation area. Ms. Lokshin inquired about the base total amount of construction costs, which was said to be around twenty-one million two hundred and seven thousand dollars. Mr. Harper determined that the October/November construction timeline is still the goal as of this time.

D. Update on County Plaza and Program Statements Budget Discussion – Bailey Edward Design – Karla Smalley delivered the update. Ms. Smalley gave a level-by-level breakdown of the 80,000 square foot space usage of the County Plaza Building. Ms. Smalley expressed that it is likely that purchasing anything with a computer component would most likely be escalating with a ten percent price increase at this point in time. The overall construction cost is believed at this time, to be around twenty-one point five million with an eight percent escalation rate. Mr. Brenner informed the committee that bids for construction would most likely be delayed.

E. Update on Courthouse Parking Lot F, County Plaza Parking Lot and Sav-A-Lot Parking Lot. Mr. Brenner gave an update on Lot F and the transition to employee only parking for Courthouse staff. County Plaza is currently being used for Courthouse employees at this time also. However, the goal is to begin repair to the Plaza parking deck as soon as possible to avoid increasing construction costs. This will displace the employees parking there during construction. While it was determined that Niemann Foods had sold the Sav-A-Lot Parking lot, this is not the case as their deal fell through. That being the case Courthouse employees parking at Sav-A-Lot will be able to continue to park there and the lease will continue with Champaign County for the time being. Mr. Brenner has reached out to the City of Urbana to entertain leasing parking spaces at the Civic Center if need be.

VII. Other Business

None.

VIII. Presiding Officer's Report

A. Future Meeting – **Tuesday, September 6, 2022** @ 6:30pm

IX. Designation of Items to be Placed on the Consent Agenda

None.

X. Adjournment

The meeting adjourned at 7:17 P.M.

PROJECT MANUAL

CHAMPAIGN COUNTY PLAZA PARKING GARAGE RENOVATION

FOR

CHAMPAIGN COUNTY, ILLINOIS
100 E. Main Street
URBANA, ILLINOIS 61801

ISSUED FOR BID
Review Copy

Architect's Project # 21212

ITB # 2022-007

September 7, 2022

Bailey Edward Design, Inc.
1103 S. Mattis Avenue
Champaign, Illinois 61821
217.363.3375

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SPECIFIER(S): ARCHITECTURAL:

David Kennedy, Bailey Edward Design, Inc.
217.363.3375 Email: dkennedy@baileyedward.com

Jake Wolf, Engineering Resource Associates, Inc.
217.351.6268 Email: jwolf@eraconsultants.com

INVITATION TO BID:

CHAMPAIGN COUNTY PLAZA PARKING GARAGE RENOVATION

Sealed bids for the Champaign County Plaza Parking Garage Renovation Project will be received by the Champaign County at the Brookens Administrative Center, 1776 East Washington Street, Urbana, IL 61802. Bids will be opened publicly.

Work generally includes but is not limited to the following:

- Repair of structural elements
- Concrete repair and replacement
- Handrails
-

Proposals must be submitted on the forms provided and shall contain no qualifications or interlineations. In submitting a bid, it is agreed that the bid may not be withdrawn for a period of thirty (30) days after Bid Date.

The Owner reserves the right to require from any bidder, prior to contract award, a detailed statement regarding the business and technical organization of the bidder that is available for the contemplated work, and a list of his proposed subcontractors. Information pertaining to financial resources may also be required.

A Bid Security in the form of a cashier's check, certified check, or acceptable bidder's surety bond, made payable to the Owner, in an amount that is not less than ten percent (10%) of the Bid proposal submitted, including all Alternates, shall accompany each Bid as a guarantee that: (1) the Bidder will not modify, withdraw or cancel the proposal for thirty (30) days after the bid date; and (2) the bidder, if awarded the contract, will promptly enter into a contract and execute such bonds and furnish such insurance certificates as may be required. Should the Bidder fail to honor these two (2) guarantees for any reason, the Owner shall total the damages and shall deduct the amount of such damages from the Bidder's Bid Security. Should the damages total less than the amount of the Bid Security, the difference shall be returned to the Bidder. However, all damages in excess of the Bid Security shall be borne by the Owner. Damages may include, but shall not be limited to, reasonable compensation for the Owner's additional time spent, additional Architect's fees, costs to the Owner for delays in completion of the Work based upon the Bidders proposed Contract Time and the Contract Time as Awarded including, but not limited to, interest expense and lost revenue, the difference between the Bidder's proposed Contract Sum and the Contract Sum as awarded and costs to re bid the Project should such action become necessary. Such bid securities will be returned to the unsuccessful bidders after execution of the Contract.

Sealed bids for the proposed work will be received up to the hour of **2:00 P.M.** Central Daylight Time on **Thursday, September 29, 2022** at the Shields-Carter Meeting Room, Brookens Administrative Center, 1776 East Washington Street, Urbana, IL 61802.

A pre-bid conference will be held in the County Plaze Building, 101 E. Main Streett, Urbana, IL 61802, on **Friday, September 16, 2022** at **2:00 P.M.** CDT.

A complete set of documents will be available from Eastern Engineering, 404 E. University Ave., Champaign, IL. 61820, www.easternengineering.com, 217.359.3261.

Refundable Plan Deposit: $75 for each set of bid documents. Two (2) sets maximum, Additional sets may be purchased without refund. For Electronic sets, contact Eastern Enginering.

Plan deposits will be refunded in full upon the return of the Bid Documents, in good condition, within ten (10) days after the bid opening. The deposits of General Contractors, who do not submit a bonafide bid or do not return the Bid Documents within ten (10) days after the bid opening, will not be refunded.

Contractor and Subcontractors shall include in bids, the cost for the current prevailing wage (Illinois Prevailing Wage Act - 820 ILCS 130/0.01 et seq.). The Contractor shall ensure that any Subcontractors shall comply with the Illinois Prevailing Wage Act.

The Owner reserves the right to reject any or all bids, to waive any irregularities in the bidding, or to accept the bids that in their judgment will be for their best interest.

Once awarded the contract, the Contractor will furnish a satisfactory performance bond, execute the contract and proceed with the work. The Contractor shall indicate the amount of the performance bond on the bid form.

END OF SECTION 00 11 16

DIVISION 0 – BIDDING AND CONTRACT REQUIREMENTS

PART 1 - Section 00 21 13 – Instructions to Bidders

1.1 INSTRUCTIONS TO BIDDERS

A. AIA Document A701, "Instructions to Bidders," is hereby incorporated into the Procurement and Contracting Requirements by reference.
   1. A copy of AIA Document A701-2018, "Instructions to Bidders," is bound in this Project Manual.

B. AIA Document A201 “General Conditions” is hereby incorporated into the Procurement.
   1. A copy of AIA Document A201-2017 “General Conditions” is bound in this project manual.

END OF DOCUMENT 00 21 13

AIA® Document A701™ – 2018

Instructions to Bidders

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

Champaign County Plaza
101 E. Main Street
Urbana, IL 61801

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

Champaign County, IL
1776 East Washington Street
Urbana, IL 61802

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

Bailey Edward Design, Inc.
1103 S. Mattis Avenue
Champaign, IL 61821
Telephone Number: 217.363.3375

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.)

AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

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

Champaign County Plaza
101 E. Main Street
Urbana, IL 61801

THE OWNER:
(Name, legal status and address)

Champaign County, Illinois
1776 East Washington Street
Urbana, IL 61802

THE ARCHITECT:
(Name, legal status and address)

Bailey Edward Design, Inc,
1103 S. Mattis Avenue
Champaign, IL 61821

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.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

INDEX

(Topics and numbers in bold are Section headings.)

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 a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's 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 the Owner and by Separate Contractors.

§ 1.1.5 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.

§ 1.1.6 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.

§ 1.1.7 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.

§ 1.1.8 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 Architect does 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.

§ 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 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 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.

§ 2.3.5 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.

§ 2.3.6 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.

§ 2.4 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 prior approval of the Architect and the 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 Architect's 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 Architect in the Architect's 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 2.3.4, 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 Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the 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 Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the 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 and 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. Unless the Architect 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 Work 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 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 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 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 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 Contractor shall secure and pay for the building permit as well as 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 and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect 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 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 and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that 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 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 of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect 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 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 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.

§ 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 Architect's approval. The Architect'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 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 perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 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 Architect and Owner, and delivered to the Architect 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 is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is 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 Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner 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 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 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 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 and the Architect 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.

§ 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 Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

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.

§ 3.14 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 or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, 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 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 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 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 or Architect. 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.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, 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

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

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The 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. The 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.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the

Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor 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 Contractor 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 Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 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. Review of such submittals 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 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 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.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 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 Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

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

§ 4.2.12 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 rendered in good faith.

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

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests 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 a Separate Contractor or the subcontractors of a Separate Contractor.

§ 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 Owner 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 Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect 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 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 or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner 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 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 and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner 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 and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. 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 separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 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 and Separate 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 or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work,

promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify 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 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 Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor 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 a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 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 or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor 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, 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 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, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner 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

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect 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 Architect and signed by the Owner 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 Architect 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 Architect 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 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 Architect 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 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 Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's 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 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 Architect will 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 Architect 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 Architect 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 or Architect, of an employee of either, or of a Separate Contractor; (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 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 Architect 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 Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and

unless objected to by 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 ten days before the date established for each progress payment, the Contractor shall submit to the Architect 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 or Architect require, such as copies of requisitions, and releases and waivers of liens 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 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 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor 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 Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, 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 entitled to payment in the amount certified. The foregoing representations 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 Architect. However, the issuance of a Certificate for Payment will not be a representation that the 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 Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The 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 previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from 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;
- **.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 withholds certification for payment under Section 9.5.1.3, 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 Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a 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 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 Architect 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 Architect and Owner 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 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 Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after 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 Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner 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 that 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 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 Contractor's list, the Architect 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 Contractor's 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 to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare 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 shall 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.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, 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 receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's 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 Architect's final 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 (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 Architect so confirms, the Owner shall, upon application by the Contractor and certification by the 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 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.

§ 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; and
- **.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.

§ 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 and 10.2.1.3 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 and 10.2.1.3. 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 or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either 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 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 and Substances

§ 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 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 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 and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor 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, Architect, 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 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, 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 to the Owner 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 the Contractor 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 to the Contractor 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 Architect and Architect's consultants; and (3) 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 Architect, Architect's consultants, 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 and Architect 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 Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the 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 Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's 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 Architect has not specifically requested to examine prior to its being covered, the 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 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 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 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 or Separate 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, 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 Architect timely notice of when and where tests and inspections are to be made so that the 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 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 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 Architect of when and where tests and inspections are to be made so that the 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 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 Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the 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 Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, 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 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 or entities 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 and the 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, 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 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 be certified by the Initial Decision Maker, upon application, 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 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 the 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 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 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 after 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.

DIVISION 0 – BIDDING AND CONTRACT REQUIREMENTS
Section 00 22 13 – Supplementary Instructions to Bidders

1.1 INSTRUCTIONS TO BIDDERS

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

1. AIA Document A701 - 2018, "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 2.1.7:

1. 2.1.7 - 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 2.1.8:

1. 2.1.8 - The Bidder is a properly licensed Contractor according to the laws and regulations of the local and state jurisdictions and meets qualifications indicated in the Procurement and Contracting Documents.

C. Add Section 2.1.9:

1. 2.1.9 - 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. 3.4 - 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 4.1.9:

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. 4.2 - Bid Security:
1. Delete section 4.2.1 and replace with the following:
a. Each Bid shall be accompanied by a bid security in the form and amount required in the bid documents and noted in 00 41 06.

C. 4.3 - Submission of Bids:

1. Delete section 4.3.1 and replace with the following:
a. A Bidder shall submit paper copies its Bid, the bid security, and all other documents required by the bid documents.

2. Add Section 4.3.2.1:

a. 4.3.2.1 - Include Bidder's Contractor License Number applicable in Project jurisdiction on the face of the sealed bid envelope.

D. 4.4 - Modification or Withdrawal of Bid:

1. Add the following sections to 4.4.1:

a. 4.4.1.1 - 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. 4.4.1.2 - 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.

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 Engineer'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 – POST-BID 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 five days after the bid submittal.

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 – A Performance Bond will be required, 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:

a. 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 – ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

A. The form of agreement between Owner and Contractor is included in specifications and is bound in this project manual.

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, 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 or the date that the Bidder is obligated to deliver the executed Agreement and required bonds to Owner.

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 DOCUMENT 00 22 13

DIVISION 0 – BIDDING AND CONTRACT REQUIREMENTS
Section 00 22 44 - Additional Insurance Requirements

1.1 INSURANCE

The Contractor shall purchase and maintain insurance as required in the current edition of the Standard Form of Agreement Between Owner and Contractor where the Basis of Payment is a Stipulated Sum, AIA Document A101 and the General Condition of the Contract for Construction, AIA Document A201 as modified by these specifications, AIA General Conditions and Supplements to the AIA General Conditions, Article 11

A. All of the above documents shall be thoroughly studied prior to purchases of an insurance policy to cover the Project.

B. While not limited to the following requirements, the requirements listed below are brought to the Contractors Specific attention.

1) Champaign County, and the Architect/Engineer shall be named as additional insureds on the Commercial General Liability Policy and the Umbrella Liability Policy.

2) Waivers of Subrogation are required for both Property Insurance and for Liability Insurance.

1.2 ADDITIONAL LIABILITY INSURANCE REQUIREMENTS

In addition to the liability insurance requirements noted in Paragraph 1.01 above, the following requirements also apply:

A. The Contractor shall purchase and maintain a Commercial General Liability Policy which shall include the following coverage areas:

1) Operations of the Contractor - direct liability coverage for the Contractors activities at a permanent location and the Project Site;
2) Operations of Subcontractors - Liability coverage for those entities for which the Contractor has a duty to supervise and stand legally responsible for their conduct;
3) Completed Operations - Liability for property damage and bodily injury and death that occurs after Substantial Completion;
4) Personal Injury - Including but not limited to, libel, slander, defamation of character, wrongful eviction, right of private occupancy, false arrest and detention and other similar personal injuries;
5) Employees as Additional Insured - Include employees and their acts into the coverage;
6) Explosion, Collapse, Underground - Liability coverage for the property of others to include, but not limited to, unknown utilities; and
7) Contractual Liability - coverage for the assumption of others by Contract.

B. The Commercial General Liability Policy shall name Champaign County, the Architect, the Architect's Consultants, their agents and employees as additional insured.

C. The Contractor shall purchase and maintain Workers Compensation and Employees Liability Insurance.

D. The Contractor shall purchase and maintain commercial Automobile Liability Insurance. This policy shall cover Owned, Non-owned and Hired vehicles.

E. The Contractor shall purchase and maintain Umbrella Liability Coverage to provide higher limits of liability above those required for General Liability, Employers Liability and Automobile Liability.

F. The Umbrella Liability Policy shall name Champaign County, the Architect, the Architect's Consultants, their agents and employees as additional insured.

G. The Contractor shall purchase and maintain Owners Liability Insurance (Owners Protection Liability) which shall cover the Owners liability for all injuries and damages arising from the Project. This policy shall name the Architect and the Architect's Consultants, their agents and employees as additional insured.

H. Liability limits shall be as specified herein or the maximum exposure as stated in the Government Tort Claims Acts as most recently amended, whichever is higher.

I. The minimum amount of coverage and the limits of liability shall be as specified below:

1) Claims under workers' or workman's compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed:

a. As required by law.

2) Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees:

a. $1,000,000.00

3) Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees:

a. $ 500,000.00

4) Claims for damages insured by usual personal injury liability coverage which are sustained (1) by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor, or (2) by another person:

a. $1,000,000.00

5) Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom:

a. $ 500,000.00

6) Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle:

a. $1,000,000.00

7) Claims involving contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18 of the General Conditions for the Contract for Construction as modified:

a. $ 500,000.00

1.3 SUBMITTAL REQUIREMENTS

A. Submit ACORD 25-S form along with the signed Agreement Between Owner and Contractor.

B. Champaign County shall be listed as Certificate Holder.

C. Include the following sentence under Special Items:

"The Certificate Holder is Champaign County, Architect, Architect's Consultants, including their Agents and Employees are named as additional insured's in both the General and Umbrella Liability Policy. Waivers of Subrogation are in effect for both liability and property insurance policies."

1.4 LOSS OF USE INSURANCE

A. The Owner, at the Owners option, may purchase and maintain such insurance that will protect the Owner against the loss of use of this property.

END OF SECTION 00 22 44

1.1 PREBID MEETING

A. There will be a Prebid meeting as indicated below:

1. Meeting Date: Friday, September 16, 2022
2. Meeting Time: 2:00 P.M. CDT.
3. Location: Champaign County Plaza Building, 101 E. Main Street, Urbana, IL 61802

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

C. 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. Instructions to Bidders.
   b. Bidder Qualifications.
   c. Bonding.
   d. Insurance.
   e. Bid Form and Attachments.
   f. Bid Submittal Requirements.
   g. 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. Unit Price.
   f. Substitutions following award.

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

6. Site/facility visit or walkthrough.

7. Post-Meeting Addendum.

D. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes to attendees of prebid meeting only. 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.

END OF DOCUMENT 00 25 13

RETURN WITH BID

_____

_____

as Principal, and _____

a corporation of the State of _____

as Surety, are held and firmly bound unto the Champaign County the amount of ten percent (10%) of the amount of the base bid for the payment of which Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, to this agreement.

Principal has submitted to Obligee a bid to enter into a written contract, for

Project Number: _____ Division of Work: _____

in accordance with bidding documents for the project, which contract is by reference made a part hereof and is hereinafter referred to as "the Contract".

THE CONDITION OF THIS OBLIGATION is that if Principal, upon acceptance by Obligee of its bid within the period of time specified for acceptance, shall comply with all post award requirements as required by the terms of the bid within the time specified after date of the Notice of Award, or in the event of the failure to comply with all post award requirements, if Principal shall pay Obligee (1) for all costs of procuring the work which exceeds the amount of its bid, or (2) shall pay Obligee the amount of this bond as liquidated damages in the event Principal is a sole bidder and after an attempt to secure other bids by readvertising none can be obtained, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

Surety hereby agrees that its obligation shall not be impaired by any extensions of time for Obligee's acceptance or compliance with post award requirements. Surety hereby waives notice of such extensions.

Signed and sealed this _____ day of _____ , 20____.

_____	_____
CONTRACTOR	SURETY
BY _____	BY _____
SIGNATURE	OFFICER OF THE SURETY
Title _____	Title _____

ATTEST:

_____

CORPORATE SECRETARY (Corporations only)

JURAT (Notary's Statement Authenticating Signature)

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public in and for said county, do hereby certify that

(Insert Name of Attorney-In-Fact for SURETY)

who is personally known to me to be the same person whose name is subscribed to the foregoing instrument on behalf of SURETY, appeared before me this day in person and acknowledged respectively, that he/she signed, sealed, and delivered said instrument as his/her free and voluntary act for the uses and purposes therein set forth.

Given under my hand and notarial seal this _____ DAY OF _____ A.D. 20 ____

My commission expires _____

Notary Signature _____

DIVISION 0 – BIDDING AND CONTRACT REQUIREMENTS
Section 00 41 13 – Bid Form – Stipulated Sum (Singe-Prime Contract)

1.1 BID INFORMATION

A. Bidder: _____.
B. Project Name: Champaign County Plaza Parking Garage Renovation
C. Project Location: 101 E. Main Street, Urbana, Illinois 61801
D. Owner: Champaign County

1.2 CERTIFICATIONS AND BID

A. **Base Bid, Single-Prime (All Trades) Contract**: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by Bailey Edward Design, Inc., 1103 S. Mattis Avenue, Champaign, IL 61821, and their consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

1. _____ Dollars

($_____)

1.3 TIME OF COMPLETION

A. Provided the contractor receives Notice to Proceed on or prior to November 30, 2022 the bidder agrees to be substantially complete with the Base Bid work on or before June 1, 2023.

1.4 ACKNOWLEDGEMENT OF ADDENDA

A. 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 _____.

1.5 SUBMISSION OF BID

A. In submitting the Bid, the undersigned agree that this Proposal will not be withdrawn for a period of thirty (30) calendar days from the date of submission. It is understood the Owner reserves the right to reject any and all Bids and to waive informalities and irregularities.

1. Respectfully submitted this ____ day of _____, 2021.

2. Submitted By :_____
(Name of bidding firm or corporation).

3. Authorized Signature :_____
(Handwritten signature).

4. Signed By :_____
(Type or print name).

5. Title :_____
(Owner/Partner/President/Vice President).

6. Witness By :_____
(Handwritten signature).

7. Attest :_____
(Handwritten signature).

8. By :_____
(Type or print name).

9. Title :_____
(Corporate Secretary or Assistant Secretary).

10. Street Address:_____.

11. City, State, Zip: _____.

12. Phone: _____.

13. License No.:_____.

14. Federal ID No. :_____

(Affix Corporate Seal Here).

END OF DOCUMENT 00 41 13

RETURN WITH BID

BIDDER'S / CONTRACTOR'S DISCLOSURE AFFIDAVIT

STATE OF ILLINOIS)
) SS
COUNTY OF _____)

BUSINESS STATUS STATEMENT

I, the undersigned, being duly sworn, do state as follows:

A. _____ (hereafter "Contractor") is a:
Company Name

(Place a mark in front of appropriate type of business)

_____ Corporation (If a Corporation, complete B)

_____ Partnership (If a Partnership, complete C)

_____ Individual Proprietorship (If an Individual, complete D)

B. CORPORATION

The State of Incorporation is _____

The registered agent of the Corporation in Illinois is:

Name: _____

Address: _____

City, State, Zip: _____

Telephone: _____

The Corporate officers are as follows:

President: _____

Vice President: _____

Secretary: _____

Treasurer: _____

RETURN WITH BID

C. PARTNERSHIP
The Partners are as follows (attach additional sheets if necessary):

Name	Address
Name	Address
Name	Address
Name	Address

The business address is: _____

D. INDIVIDUAL PROPRIETORSHIP

The business address is: _____

Business Telephone: _____

My home address is: _____

Home Telephone: _____

E. Under penalty of perjury _____

(Contractor's Name)

Certifies that _____ (FEIN / SSN)
is its correct Federal Taxpayer Identification Number, or in the case of an individual or sole proprietorship, Social Security Number.

NON-DISCRIMINATION STATEMENT

The Contractor does not and will not engage in discriminatory practices; the Contractor does not and will not engage in discrimination because of race, sex, age, religion, national origin or sensory, mental, or physical handicap in hiring or firing; and the Contractor is, in fact, an equal opportunity employer.

RETURN WITH BID

NON-COLLUSION STATEMENT

A. That the only persons or corporations interested with _____ (Name of Bidder) in the delivery of the materials and/or services bid upon under the Contract other than its officers, directors, shareholders and employees are:

Name	Address
Name	Address
Name	Address
Name	Address

B. That the said Bid is made without any connection or common interest in the profits with any other persons making any Bid or Proposal for said Work except as listed above.

C. That this Contract is in all respects fair and entered into without collusion or fraud.

D. That no employee or any officer of the Owner has any financial interest, directly or indirectly, in the award of this Bid to Bidder except as listed above.

E. That the Bidder is not barred from bidding on this Contract as a result of violation of either Section 33E-3 (Bid Rigging) or Section 33E-4 (Bid Rotating) of Chapter 38, Illinois Revised Statutes.

F. The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

NO DELINQUENT ILLINOIS TAXES STATEMENT

The undersigned certifies that the Contractor is not delinquent in payment of any tax administered by the Illinois Department of Revenue except that the taxes for which liability for the taxes or the amount of the taxes are being contested, in accordance with the procedure established by the appropriate Revenue Act; or the Contractor has entered into an agreement (2) with the Illinois Department of Revenue for the payment of all such taxes due and is in compliance with the agreement.

RETURN WITH BID

FAMILIARITY WITH LAWS STATEMENT

I, the undersigned, being duly sworn, do hereby state that _____
(Company Name)
is familiar with and will comply with all Federal, State and Local laws applicable to the Project, which include, but are not limited to, the Prevailing Wage Act and the Davis-Bacon Act.

PENDING AND UNCOMPLETED WORK

I, the undersigned, being duly sworn, do hereby declare that the following is a true and correct statement relating to **all** uncompleted contracts of the undersigned for Federal, State, County, City and private work, including **all** subcontract work; and all pending low BIDS not yet awarded or rejected:

Total Projects Under Contract _____

Total Projects with Pending Low Bids _____

Total Value of Projects Under Contract and Pending Low Bids

_____
(Affiant's Signature) (Print Name & Title)

_____
(Company Name)

SUBSCRIBED and SWORN to before me this

_____ day of _____ , 2021

Notary Public

My Commission Expires: _____

(SEAL)

INSTRUCTIONS: This affidavit is to be completely filled out and executed by the chief officer of the Bidder authorized to submit the affidavit. Attach written explanation where applicable.

RETURN WITH BID

DRUG FREE WORKPLACE CERTIFICATION

STATE OF _____)
) SS
COUNTY OF _____)

Note: The Illinois Drug Free Workplace Act, effective January 2, 1992, requires the Owner to obtain this certification from each contractor with 25 or more employees or with contracts for $5,000 or more.)

The Contractor certifies that it will:

A. Public a statement:

1. Notifying employees that the unlawful manufacture, distribution, dispensation, possession or use of a controlled substance, including cannabis, is prohibited in the grantee's or contractor's workplace.

2. Specifying the actions that will be taken against employees for violations of such prohibitions.

3. Notifying the employee that, as a condition of employment on such contract or grant, the employee will:

   a. Abide by the terms of the statement; and

   b. Notify the employer of any criminal drug statute conviction for a violation occurring in the workplace no later than 5 days after such conviction.

B. Establish a drug free awareness program to inform employees about:

1. The dangers of drug abuse in the workplace.

2. The Contractor's policy of maintaining a drug free workplace.

3. Any available drug counseling, rehabilitation and employee assistance program.

4. The penalties that may be imposed upon employees for drug violations.

C. Give a copy of the published statement referred to in paragraph A above to each employee engaged in the performance of the Owner's contract and post the statement in a prominent place in the workplace.

RETURN WITH BID

D. Notify the Owner within 10 days after receiving notice under paragraph A.3.b. above from an employee or otherwise receiving actual notice of such conviction.

E. Impose a sanction on, or require the satisfactory participation in a drug abuse assistance or rehabilitation program by any employee who is so convicted.

F. Assist employees in selecting a course of action in the event drug counseling, treatment or rehabilitation is required and a trained referral team is in place.

G. Make a good faith effort to continue to maintain a drug free workplace through implementation of the Drug Free Workplace Act.

If an individual, the Contractor certifies that it will not engage in the unlawful manufacture, distribution, dispensation, possession or use of a controlled substance in the performance of the Owner's contract.

The Contractor shall, within 30 days after receiving notice from an employee of a conviction of a violation of a criminal drug statute occurring in the workplace:

A. Take appropriate personnel action against such employee up to and including termination; and

B. Require the employee to satisfactorily participate in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State or local health, law enforcement or other appropriate agency.

Contractor:

By:_____

Title:_____

SIGNED and SWORN to before me this

_____ day of _____, 2021.

_____
Notary Public

1. PREVAILING WAGE ACT

1.1 Pursuant to Illinois Compiled Statutes 820 ILCS 130/0.01 et seq., these specifications list on the following pages, the Illinois Department of Labor prevailing rate of wages for the county where the contract is being performed and for each craft or type of worker needed to execute the contract.

1.2 Contractor shall submit certified payrolls with monthly application for payment.

1.3 A Project Labor Agreement is required for this project.

END OF SECTION 00 43 43

Champaign County Prevailing Wage Rates posted on 8/16/2022

						Overtime								
Trade Title	**Rg**	**Type**	**C**	**Base**	**Foreman**	**M-F**	**Sa**	**Su**	**Hol**	**H/W**	**Pension**	**Vac**	**Trng**	**Other Ins**
ASBESTOS ABT-GEN	All	BLD		35.12	36.37	1.5	1.5	2.0	2.0	7.25	18.61	0.00	0.90	
ASBESTOS ABT-MEC	All	BLD		25.45	26.45	1.5	1.5	2.0	2.0	9.95	8.25	0.00	0.50	
BOILERMAKER	All	BLD		41.00	45.00	1.5	1.5	2.0	2.0	7.07	23.45	0.00	1.96	
BRICK MASON	All	BLD		35.16	36.92	1.5	1.5	2.0	2.0	9.25	16.30	0.00	0.91	
CARPENTER	All	BLD		37.83	40.08	1.5	1.5	2.0	2.0	9.25	17.23	0.00	0.78	
CARPENTER	All	HWY		38.10	39.85	1.5	1.5	2.0	2.0	9.25	19.40	0.00	0.75	
CEMENT MASON	All	BLD		36.36	38.86	1.5	1.5	2.0	2.0	10.00	11.70	0.00	0.50	
CEMENT MASON	All	HWY		37.24	39.24	1.5	1.5	2.0	2.0	10.00	13.00	0.00	0.50	
CERAMIC TILE FINISHER	All	BLD		33.17	33.17	1.5	1.5	2.0	2.0	9.25	12.70	0.00	0.50	
ELECTRIC PWR EQMT OP	All	ALL		50.97	60.48	1.5	1.5	2.0	2.0	8.53	14.27	0.00	0.76	
ELECTRIC PWR GRNDMAN	All	ALL		34.63	60.48	1.5	1.5	2.0	2.0	8.04	9.70	0.00	0.52	
ELECTRIC PWR LINEMAN	All	ALL		56.74	60.48	1.5	1.5	2.0	2.0	8.70	15.88	0.00	0.85	
ELECTRIC PWR TRK DRV	All	ALL		36.35	60.48	1.5	1.5	2.0	2.0	8.09	10.18	0.00	0.54	
ELECTRICIAN	All	BLD		45.12	49.63	1.5	1.5	2.0	2.0	7.35	11.43	0.00	0.68	
ELECTRONIC SYSTEM TECH	All	BLD		33.89	36.89	1.5	1.5	2.0	2.0	7.35	11.36	0.00	0.40	
ELEVATOR CONSTRUCTOR	All	BLD		51.01	57.39	2.0	2.0	2.0	2.0	16.02	20.21	4.08	0.65	
FENCE ERECTOR	All	ALL		35.50	37.50	1.5	1.5	2.0	2.0	11.74	15.00	0.00	1.11	
GLAZIER	All	BLD		37.95	39.95	1.5	1.5	2.0	2.0	7.45	12.57	0.00	0.68	
HEAT/FROST INSULATOR	All	BLD		34.90	36.40	1.5	1.5	2.0	2.0	8.49	13.79	0.00	0.30	0.65
IRON WORKER	All	ALL		35.50	37.50	1.5	1.5	2.0	2.0	11.74	15.00	0.00	1.11	
LABORER	All	BLD		32.12	33.37	1.5	1.5	2.0	2.0	7.25	18.61	0.00	0.80	
LABORER	All	HWY		35.17	36.17	1.5	1.5	2.0	2.0	7.25	18.73	0.00	0.80	
LATHER	All	BLD		37.83	40.08	1.5	1.5	2.0	2.0	9.25	17.23	0.00	0.78	
MACHINIST	All	BLD		53.18	57.18	1.5	1.5	2.0	2.0	9.93	8.95	1.85	1.47	
MARBLE FINISHER	All	BLD		33.17	33.17	1.5	1.5	2.0	2.0	9.25	12.70	0.00	0.50	
MARBLE MASON	All	BLD		34.69	34.69	1.5	1.5	2.0	2.0	9.25	12.70	0.00	0.50	
MILLWRIGHT	All	BLD		34.58	36.83	1.5	1.5	2.0	2.0	9.25	20.94	0.00	0.78	
MILLWRIGHT	All	HWY		38.82	40.57	1.5	1.5	2.0	2.0	9.25	21.71	0.00	0.75	
OPERATING ENGINEER	All	ALL	1	43.85	46.85	1.5	1.5	2.0	2.0	11.35	12.50	0.00	1.30	
OPERATING ENGINEER	All	ALL	2	28.75	46.85	1.5	1.5	2.0	2.0	11.35	12.50	0.00	1.30	
OPERATING ENGINEER	All	ALL	3	45.85	46.85	1.5	1.5	2.0	2.0	11.35	12.50	0.00	1.30	

PAINTER	All	ALL		36.56	38.06	1.5	1.5	2.0	2.0	9.85	7.28	0.00	0.60	
PAINTER - SIGNS	All	ALL		36.56	38.06	1.5	1.5	2.0	2.0	9.85	7.28	0.00	0.60	
PILEDRIVER	All	BLD		38.83	41.08	1.5	1.5	2.0	2.0	9.25	17.23	0.00	0.78	
PILEDRIVER	All	HWY		38.10	39.85	1.5	1.5	2.0	2.0	9.25	19.40	0.00	0.75	
PIPEFITTER	All	BLD		48.54	51.55	1.5	1.5	2.0	2.0	8.75	11.14	0.00	2.14	0.10
PLASTERER	All	BLD		36.05	38.05	1.5	1.5	2.0	2.0	9.85	13.77	0.00	0.50	
PLUMBER	All	BLD		48.54	51.55	1.5	1.5	2.0	2.0	8.75	11.14	0.00	2.14	0.10
ROOFER	All	BLD		36.00	39.00	1.5	1.5	2.0	2.0	10.47	9.34	0.00	0.56	
SHEETMETAL WORKER	All	BLD		41.30	43.80	1.5	1.5	2.0	2.0	10.05	15.97	0.00	0.55	2.02
SPRINKLER FITTER	All	BLD		44.98	47.98	1.5	1.5	2.0	2.0	10.99	14.82	0.00	0.52	
STONE MASON	All	BLD		35.16	36.92	1.5	1.5	2.0	2.0	9.25	16.30	0.00	0.91	
TERRAZZO FINISHER	All	BLD		33.17	33.17	1.5	1.5	2.0	2.0	9.25	12.70	0.00	0.50	
TERRAZZO MASON	All	BLD		34.69	34.69	1.5	1.5	2.0	2.0	9.25	12.70	0.00	0.50	
TILE MASON	All	BLD		34.69	34.69	1.5	1.5	2.0	2.0	9.25	12.70	0.00	0.50	
TRUCK DRIVER	All	ALL	1	40.91	45.27	1.5	1.5	2.0	2.0	14.69	7.16	0.00	0.25	
TRUCK DRIVER	All	ALL	2	41.50	45.27	1.5	1.5	2.0	2.0	14.69	7.16	0.00	0.25	
TRUCK DRIVER	All	ALL	3	41.77	45.27	1.5	1.5	2.0	2.0	14.69	7.16	0.00	0.25	
TRUCK DRIVER	All	ALL	4	42.16	45.27	1.5	1.5	2.0	2.0	14.69	7.16	0.00	0.25	
TRUCK DRIVER	All	ALL	5	43.26	45.27	1.5	1.5	2.0	2.0	14.69	7.16	0.00	0.25	
TRUCK DRIVER	All	O&C	1	32.73	36.22	1.5	1.5	2.0	2.0	14.69	7.16	0.00	0.25	
TRUCK DRIVER	All	O&C	2	33.20	36.22	1.5	1.5	2.0	2.0	14.69	7.16	0.00	0.25	
TRUCK DRIVER	All	O&C	3	33.42	36.22	1.5	1.5	2.0	2.0	14.69	7.16	0.00	0.25	
TRUCK DRIVER	All	O&C	4	33.73	36.22	1.5	1.5	2.0	2.0	14.69	7.16	0.00	0.25	
TRUCK DRIVER	All	O&C	5	34.61	36.22	1.5	1.5	2.0	2.0	14.69	7.16	0.00	0.25	
TUCKPOINTER	All	BLD		35.16	36.92	1.5	1.5	2.0	2.0	9.25	16.30	0.00	0.91	

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

Trng Training
Other Ins Employer hourly cost for any other type(s) of insurance provided for benefit of worker.

Explanations CHAMPAIGN COUNTY

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, MARBLE FINISHER, TERRAZZO FINISHER

Assisting, helping or supporting the tile, marble and terrazzo mechanic by performing their historic and traditional work assignments required to complete the proper installation of the work covered by said crafts. 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 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.

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.

OPERATING ENGINEERS - BUILDING, HEAVY AND HIGHWAY CONSTRUCTION Class 1. Draglines, Derricks, Shovels, Gradalls, Mechanics, Tractor Highlift, Tournadozer, Concrete Mixers with Skip, Tournamixer, Two Drum Machine, One Drum Hoist with Tower or Boom, Cableways, Tower Machines, Motor Patrol, Boom Tractor, Boom or Winch Truck, Winch or Hydraulic Boom Truck, Tournapull, Tractor Operating Scoops, Bulldozer, Push Tractor, Asphalt Planer, Finishing Machine on Asphalt, Large Rollers on Earth, Rollers on Asphalt Mix, Ross Carrier or similar Machine, Gravel Processing Machine, Asphalt Plant Engineer, Paver Operator, Dredging Equipment, or Dredge Engineer, or Dredge Operator, Central Mix Plant Engineer, CMI or similar type machine, Concrete Pump, Truck or Skid Mounted, Engineer or Rock Crusher Plant, Concrete Plant Engineer, Ditching Machine with dual attachment, Tractor Mounted Loaders, Hydro Crane, Standard or Dinkey Locomotives, Scoopmobiles, Euclid Loader, Soil Cement Machine, Back Filler, Elevating Machine, Power Blade, Drilling Machine, including Well Testing, Caissons, Shaft or any similar type drilling machines, Motor Driven Paint Machine, Pipe Cleaning Machine, Pipe Wrapping Machine, Pipe Bending Machine, Apsco Paver, Boring Machine, (Head Equipment Greaser), Barber-Greene Loaders, Formless Paver, (Well Point System), Concrete Spreader, Hydra Ax, Span Saw, Marine Scoops, Brush Mulcher, Brush Burner, Mesh Placer, Tree Mover, Helicopter Crew (3), Piledriver-Skid or Crawler, Stump Remover, Root Rake, Tug Boat Operator, Refrigerating Machine, Freezing Operator, Chair Cart- Self-Propelled, Hydra Seeder, Straw Blower, Power Sub Grader, Bull Float, Finishing Machine, Self-Propelled Pavement Breaker, Lull (or similar type Machine), Two Air Compressors, Compressors hooked in Manifold, Chip Spreader, Mud Cat, Sull-Air, Fork Lifts (except when used for landscaping work), Soil Stabilizer (Seaman Tiller, Bo Mag, Rago Gator, and similar types of equipment), Tube Float, Spray Machine, Curing Machine, Concrete or Asphalt Milling Machine, Snooper Truck-Operator, Backhoe, Farm Tractors (with attachments), 4 Point Lift System (Power Lift or similar type), Skid-Steer (Bob Cat or similar type), Wrecking Shears, Water Blaster.

Class 2. Concrete Mixers without Skips, Rock Crusher, Ditching Machine under 6', Curbing Machine, One Drum Machines without Tower or Boom, Air Tugger, Self-Propelled Concrete Saw, Machine Mounted Post Hole Digger, two to four Generators, Water Pumps or Welding Machines, within 400 feet, Air Compressor 600 cu. ft. and under, Rollers on Aggregate and Seal Coat Surfaces, Fork Lift (when used for landscaping work), Concrete and Blacktop Curb Machine, One Water Pump, Oilers, Air Valves or Steam Valves, One Welding Machine, Truck Jack, Mud Jack, Gunnite Machine, House Elevators when used for hoisting material, Engine Tenders, Fireman, Wagon Drill, Flex Plane, Conveyor, Siphons and Pulsometer, Switchman, Fireman on Paint Pots, Fireman on Asphalt Plants, Distributor Operator on Trucks, Tampers, Self-Propelled Power Broom, Striping Machine (motor driven), Form Tamper, Bulk Cement Plant, Equipment Greaser, Deck Hands, Truck Crane Oiler-Driver, Cement Blimps, Form Grader, Temporary Heat, Throttle Valve, Super Sucker (and similar type of equipment).

Class 3. Power Cranes, Truck or Crawler Crane, Rough Terrain Crane (Cherry Picker), Tower Crane, Overhead Crane.

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.

DIVISION 1 - GENERAL REQUIREMENTS
Section 01 11 00 – Project Summary

1. GENERAL

1.1 WORK INCLUDED

A. Contractor shall provide all labor and materials associated with the work of this section, including:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Coordination with occupants.
5. Work restrictions.
6. Specification and drawing conventions.

1.2 PROJECT INFORMATION

A. Project Identification:

1. Champaign County Plaza Parking Garage Renovation

100 E. Main Street, Urbana, Illinois 61801

B. Owner's Representative: Dana Brenner.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

2. PRODUCTS (NOT APPLICABLE)

3. EXECUTION (NOT APPLICABLE)

END OF SECTION 01 11 00

DIVISION 1 - GENERAL REQUIREMENTS
Section 01 32 00 - Construction Schedule

1. GENERAL

1.1 REQUIREMENTS INCLUDE:

A. The General Contractor shall prepare and maintain a detailed project schedule as described below.

B. The project schedule shall be the Contractor's working schedule; used to execute the work and record and report actual progress. It shall show how the Contractor plans to complete the work within the contract time and meet any contractually specified intermediate milestone dates.

1.2 RELATED REQUIREMENTS

A. Specified Elsewhere:

1. Section 01 11 00 - Project Summary
2. Section 01 33 23 - Shop Drawings, Product Data and Samples

1.3 FORM OF SCHEDULE

A. The schedule shall provide sufficient detail and clarity so that the General Contractor can plan and control the work and the Owner and the A/E can readily monitor and follow the progress of all portions of the work. The critical activities must be clearly shown. The degree of detail must be satisfactory to the A/E and the Owner.

1. Scope of work should be identified by parking level as applicable.

B. The project schedule shall be in the form of a Gantt chart, and shall indicate the critical path, including durations.

1.4 CONTENTS OF SCHEDULE

A. The schedule must be inclusive of all installation tasks of the work.

B. Submittal and approval of shop drawings and material samples as well as delivery dates of major equipment shall be included in the project schedule.

C. Activity duration shall be in whole working days.

D. There should be at least one activity for each specification section.

1.5 UPDATING

A. The project schedule shall be updated monthly.

B. Actual activity completion dates shall be reported and recorded on the schedule.

C. Progress on uncompleted activities shall be reported.

D. Projected completion dates and activities shall be reviewed and revised if necessary.

1.6 REPORTS AND SUBMITTALS

A. Within 15 days of the Authorization to Proceed, the Contractor shall submit the project schedule to the A/E and the Owner.

B. Five (5) days prior to the pay/progress meeting, the contractor shall submit the current updated schedule to the A/E and the Owner.

1.7 REVIEWS

A. Payment and reduction of retainage may be denied by the Owner for failure to submit a proper schedule and maintaining work progress according to the project schedule.

2. PRODUCTS

(NOT APPLICABLE)

3. EXECUTION

(NOT APPLICABLE)

END OF SECTION 01 32 00

1. GENERAL

1.1 REQUIREMENTS INCLUDE

A. The Sub-contractor shall make submittals to the General Contractor. The General Contractor shall maintain a master list of submittals.

B. Submittals shall be complete and legible. Incomplete submittals will be returned and not reviewed.

1.2 GENERAL CONTRACTOR:

A. Review Sub-contractor's submittals within 5 business days.

1. Verify field dimensions.
2. Verify compliance with Contract requirements.

1.3 RELATED REQUIREMENTS

A. Specified elsewhere:

1. Submittals specific to each section are further outlined within the technical specifications. Submittals deemed incomplete or not indication as supplied by separate sub, shall be returned without review.

1.4 DEFINITIONS

A. Shop drawings: Shop drawings are original drawings prepared by Contractor, subcontractor, sub-subcontractor, supplier or distributor, which illustrated some portion of the work, showing fabrication, layout, setting or erection details.

1. Prepared by qualified detailer.
2. Identify details by reference to sheet and detail numbers shown on contract drawings.
3. Maximum sheet size: 30" x 42"
4. Submit a maximum of (5) copies. Electronic copies of submittals are preferred.

B. Product data:

1. Manufacturer's standard schematic drawings edited to fit this project.
2. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.

a. Clearly mark each copy to identify pertinent materials, products or models.
b. Show dimensions and clearances.
c. Show wiring diagrams and controls.

C. Samples: Physical samples to illustrate materials, equipment or workmanship. Approved samples establish standards by which complete work is judged. Maintain at site as directed. Protect until no longer needed.

1. Office samples: Of sufficient size to clearly illustrate:

a. Functional characteristics of product or material.
b. Full range of color samples.
c. After review, samples may be used on construction of project.

2. Field samples and mock-ups:
    a. Erect at project site at location approved by the Architect.
    b. Construct each sample or mock-up complete, including work of all crafts required in finished work.
    c. Remove as directed.

1.5 SUBMITTAL SCHEDULE

A. Submit schedule of all exhibits to Architect/Engineer within fifteen (15) business days after preconstruction meeting.

1. Prepare schedule in gnatt chart format, Include:
    a. Exhibit identification
    b. Specification section and page number
    c. Date of submittal to Architect/Engineer
    d. Latest date for final approval
    e. Fabrication time.
    f. Date of Installation
2. Architect/Engineer will review and comment on exhibit schedule and will advise the Contractor as to which submittals require longer review durations.
3. Submit number of copies of shop drawings, product data and samples which contractor requires for distribution plus (2) copies which will be retained by Architect/Engineer.

B. Accompany submittals with transmittal letter, in duplicate, containing:

1. Date
2. Project title and number
3. Contractor's name and address.
4. The number of shop drawings, product data and samples submitted.
5. Notification of deviations from Contract.
6. Other pertinent data.

C. Submittals shall include:

1. Date and revision
2. Project title and number
3. Name of:
    a. Architect/ Engineer
    b. Architect/ Engineer consultant
    c. Subcontractor
    d. Sub-subcontractor
    e. Supplier
    f. Manufacturer
    g. Separate detailer when pertinent
4. Identification of product or material.
5. Relation to adjacent structure or material.
6. Field dimensions clearly identified as such.
7. Specification section and page number.
8. Specified standards, such as ASTM number or ANSI.
9. A blank space, (5"x5"), for Architect/Engineer's stamp.

10. Identification of previously approved deviation(s) from contract documents.
11. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements and compliance with Contract.
12. Space for Contractor's approval stamp.

D. Electronic Submittals: All submittals may be submitted electronically except for those specifically listing a requirement for paper submittals or physical samples. Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single file (pdf format) incorporating submittal requirements of a single Specification Section and transmittal form. Only complete submittals will be accepted.
2. Name file with submittal number or other unique identifier, including revision identifier.
   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g.; PROJNAME_061000.01). Resubmittals shall include an alphabetic suffix after the decimal point (e.g.; PROJNAME_061000.01A)
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Using Agency/ Architect/ Engineer.
4. Transmittal Cover Sheet Form for Electronic Submittals: As described by the Architect and containing all information as indicated above for paper submittals.

1.6 RESUBMISSION REQUIREMENTS

A. Resubmit all shop drawings, product data, and samples as requested by the Contractor and/or A/E.

B. Resubmit complete package to Architect within 14 days of receiving rejected submittal.

1.7 RESPONSIBILITIES

A. Review shop drawings, product data and samples prior to submission to the next level of authority. Review Subcontractor's submittals within five (5) business days. Certify review and transmit to Architect.

B. Verify:

1. Field dimensions.
2. Field construction criteria.
3. Catalog numbers and similar data.
4. Verify compliance with contract documents.

C. Coordinate each submittal with requirements of:

1. The work.
2. The contract documents.
3. The work of other contractors.
4. The existing conditions indicated to remain.

D. Contractor's responsibility for errors, omissions or deviation from contract documents in submittals is not relieved by the Architect/Engineer's review of submittals.

E. Prior to submission, notify the Architect/Engineer in writing of all proposed deviations in submittals from Contract requirements. Substitution of materials or equipment may only be approved by change order.

F. Do not begin any work which requires submittals without Architect/Engineer's approval.

G. After Architect/Engineer's review, make response required by A/E's stamp and distribute copies. Indicate by transmittal that copy of approved data has been delivered to installer.

1.8 ARCHITECT/ENGINEER'S RESPONSIBILITIES

A. Review submittals within fourteen (14) calendar days.

B. Review for:

1. Design concept of project.
2. Compliance with Contract Documents.

C. Review all requests for proposed deviations.

D. Affix stamp, date and initials or signature certifying review of submittal, and with instructions for the Contractor.

E. Return submittals to sender for response or distribution.

2. PRODUCTS
(NOT APPLICABLE)

3. EXECUTION
(NOT APPLICABLE)

END OF SECTION 01 33 23

DIVISION 1 - GENERAL REQUIREMENTS
Section - 01 35 16 - Remodeling Project Procedures

1. GENERAL

1.1 REQUIREMENTS INCLUDE

A. General Contractor:

1. Coordinate work of employees and subcontractors.
2. Schedule elements of remodeling and renovation work to expedite completion.
3. Schedule noisy or hazardous work to avoid problems with Owner's operations.
4. In addition to demolition, cut, move or remove existing construction to provide access or to allow remodeling and new work to proceed. Include:

a. Repair or remove hazardous or unsanitary conditions.
b. Remove abandoned piping, conduit and wiring.
c. Remove unsuitable or extraneous materials not marked for salvage, such as rotted wood, brick paving, rusted metals and deteriorated concrete.

5. Patch, repair and refinish existing items to remain, to the specified condition for each material, with a neat transition to adjacent new or restored construction.
6. Note or record existing project conditions before beginning work to minimize later disputes.

1.2 RELATED REQUIREMENTS

A. Specified elsewhere:

1. 01 32 00 - Construction Schedule.
2. 01 51 50 – Use of Existing Facilities
3. 01 73 29 - Cutting and Patching
4. 01 74 13 - Construction Cleaning
5. 01 74 23 - Final Cleaning.

1.3 SEQUENCE AND SCHEDULES

A. Submit separate detailed sub-schedule for alterations work, coordinated with Construction Schedule. Show:

1. Each stage of work; occupancy dates of areas.
2. Date of Substantial Completion for each area of alteration work.
3. Crafts and subcontractors employed in each stage.

1.4 ALTERATIONS, CUTTING AND PROTECTION

A. Cut finish surfaces by methods to terminate surfaces in a straight line at a natural point of division.

2. PRODUCTS (NOT USED)

3. EXECUTION

3.1 REMOVE EXISTING CONSTRUCTION

A. Temporary Removals:

1. Remove all items as noted on the drawings or otherwise required to complete the work shown.
2. Store all items as noted on the drawings or otherwise required to complete the work shown.
3. Recondition all existing items as noted on the drawings or otherwise required to complete the work shown.
4. Reinstall all items as noted on the drawings or otherwise required to complete the work shown.

B. Remove and dispose of existing items as noted in the documents.

3.2 PERFORMANCE. Patch and extend existing work using skilled craftsmen capable of matching existing quality of workmanship. For patched or extended work, provide quality equal to that specified for new work.

3.3 DAMAGED SURFACES

A. Patch and replace all portions of existing finished surfaces found to be damaged, lifted, discolored or showing other imperfections, with matching material.

1. Provide adequate support prior to patching the finish.
2. Refinish patched portions of painted or coated surfaces in a manner to produce uniform color and texture over entire surface.
3. When existing surface cannot be matched, refinish entire surface to nearest intersections or change of direction.

3.4 TRANSITION FROM EXISTING TO RESTORED WORK

A. When restored work abuts or finishes flush with existing work, make a smooth transition. Patched work shall match existing adjacent work in texture and appearance.

1. When finished surfaces are cut in such a way that a smooth transition with restored work is not possible, terminate existing surface in a neat manner along a straight line at a natural line of division, and provide trim appropriate to finished surface.

3.5 CLEANING

A. Perform construction cleaning as specified in 01 74 13

B. At completion of work of each craft, clean area and make surfaces ready for work of successive crafts.

C. At completion of alterations work in each area, provide final cleaning in accord with 01 74 23 and return space to a condition suitable for use of User.

END OF SECTION 01 35 16

DIVISION 1 - GENERAL REQUIREMENTS
Section - 01 51 50 - Use of Existing Facilities

1. GENERAL

1.1 These requirements supplement and other sections of the Project Manual.

1.2 The Owner and public will not use the buildingfacility during construction. Some limited closure or barricades are expected for portions of the work. Contractor is responsible for coordinating all closures with Champaign County as necessary.

1.3 REQUIREMENTS INCLUDE - Contractor provide:

A. Scheduling
B. Security and site regulations
C. Entrances (if required)
D. Construction aids
E. Temporary enclosures and barriers
F. Fences
G. Temporary utilities
H. Construction Cleaning
I. Storage
J. Close-out

2. EXECUTION

2.1 SECURITY AND SITE REGULATIONS

A. Confer with the Owner's representative and obtain full knowledge of all site rules and regulations affecting work.

2.2 CONSTRUCTION AIDS: Except as noted, Contractor provide and maintain construction aids and equipment for common use and to facilitate execution of the work.

2.3 TEMPORARY ENCLOSURES AND BARRIERS - Contractor:

A. Provide temporary enclosures to separate work areas from existing parking and from areas occupied by Owner.

B. Provide and maintain suitable barriers to prevent unauthorized entry, and to protect the work.

2.4 TEMPORARY UTILITIES

A. Contractor shall provide and pay for extension or modification of services to perform the work, and for restoration of services at completion of work.

2.5 ACCESS ROADS & PARKING AREAS

A. Limit any loading of existing paved areas to 4000 p.s.i. maximum.

B. Use of existing parking facilities for construction personnel or for contractor's vehicles or equipment is not permitted.

C. Maintain roads, walks and parking areas in a sound, clean condition. Restore areas, damaged by construction operations, not in contract to original condition upon work completion prior to Final Acceptance.

D. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner's operations or construction operations.

E. Coordinate any temporary construction vehicle entrance onto the property for deliveries or access with the Owner a minimum of (3) days prior to the necessity.

F. Equipment with bearing pressure above 4000 psi shall not be allowed on the grounds or paving.

2.6 TRAFFIC REGULATION: Contractor provide traffic control and directional signs, mounted on barricades or standard posts:

A. At each change of direction of a roadway and at parking areas.

B. Provide qualified and suitably equipped flaggers when construction operations encroach on traffic lanes, as required for traffic regulation.

C. Where contractor requires sidewalk closure to execute scope of work, permits and alternative access for pedestrians shall be provided in the work of this contract.

2.7 CONSTRUCTION CLEANING

A. Each Contractor provide cleaning and disposal of waste materials, debris and rubbish during construction.

B. Coordinating Contractor to supervise and coordinate cleaning operations of all Assigned Contractors.

C. Each Contractor provide covered containers for deposit of waste materials, debris and rubbish.

2.8 STORAGE Make arrangements with Owner's Representative for any on-site storage of materials and equipment to be installed in project. Protection and security for stored materials and equipment is solely contractor's responsibility.

2.9 CLOSEOUT

A. Upon completion of need to use existing user-provided facilities, or when directed by Architect/Engineer, restore each to original or specified condition.

B. At completion of work in each area, provide final cleaning and return space to a condition suitable for use of Owner.

END OF SECTION 01 51 50

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 01 54 00 – CONSTRUCTION AIDS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDE

A. Contractor shall provide all labor and material to install and maintain construction aids and equipment for all personnel use and to facilitate execution of the work:

1. Ladders, working platforms and Scaffolding/Fall Protection.
2. Heavy Equipment.
3. Temporary enclosures, electrical power & water services, etc.
4. Construction Barriers, and dust/noise/fume separations.
5. Platforms.
6. Stairs.
7. Power and hand tools.

B. Each Contractor must comply with OSHA regulations as they relate to these construction aids and all applicable standards.

C. See respective specification sections for particular requirements.

D. Provide and maintain for own forces all other construction aids required to complete his work.

E. Remove all construction aids upon completion of the work, or as directed.

1.2 RELATED REQUIREMENTS

A. Specified elsewhere:

1. Section 01 10 00 - Project Summary.
2. Section 01 51 00 - Temporary Utilities.
3. Section 01 74 23 - Final Cleaning.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials may be new or used, suitable for purpose. Comply with specified codes, standards, and regulations.

2.2 CONSTRUCTION AIDS

A. Maintain facilities and equipment in first class condition.

PART 3 - EXECUTION

3.1 PREPARATION

A. Consult with Architect and Owner, review site conditions and factors which affect construction procedures and construction aids, including adjacent occupied areas which may be affected by execution of the work.

B. Coordinate with Owner for placement of barriers to maintain Owner operations, while protecting occupants form exposure to dust, noise, and fumes.

3.2 INSTALLATION

A. Comply with respective Project Manual Specification Sections.

B. Relocate construction aids as construction progresses to expedite storage or work and to accommodate legitimate requirements of the Owner and other contractors at the site.

3.3 REMOVAL:

A. Completely remove temporary materials, equipment and services:

1. When construction needs can be met by authorized use of permanent construction.
2. At project completion.

B. Clean and repair damage caused by installation or use of temporary facilities.

C. Restore existing facilities used for temporary purposes to original condition.

END OF SECTION 01 54 00

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 01 56 00 - TEMPORARY BARRIERS AND ENCLOSURES

PART I - GENERAL

1.1 WORK INCLUDES

A. Base Bid: Use of Barriers and Enclosures: The Contractor shall provide all labor and materials necessary to furnish, erect and maintain temporary barriers, barricades, enclosures, and temporary construction fencing as required for the following:

1. To provide weather tight protection of building as roofing or deck is removed as part of the work in contract.
2. To protect the health and safety of occupants and the general public from exposure to immediate physical harm as well as to noise, dust, and fumes. Note that this Section does not provide minimum requirements related to Indoor Air Quality.
2. To protect new and pre-existing adjacent construction from exposure to physical damage, dust, dirt, and water.
3. To provide security of valuable property.
4. To protect trees and plants.

1.2 RELATED SECTIONS

A. Section 01 54 00 - Construction Aids

PART 2 - PRODUCTS

2.1 GENERAL FABRICATION

A. Substantial Construction: Barriers and enclosures shall be of adequately substantial construction to serve their purpose without failure throughout the duration of their use. Materials may be new or used, suitable for the intended purpose, but shall not violate requirements of applicable codes and standards.

B. Rigid Fencing: The general public, as well as adjacent lawns and plantings, shall be protected from harm by the installation of continuous, durable, rigid 6 foot high fencing at the limit lines of each construction area.

C. Tree Protection: Existing trees that are adjacent to a construction site shall be protected from damage by the installation of durable, rigid 6 foot high fencing at the drip line of each tree.

D. Dust enclosures.

PART 3 - EXECUTION

3.1 BASIC REQUIREMENTS

A. Install facilities of a neat and reasonable uniform appearance, structurally adequate for required purposes.

B. Install barriers and enclosures so as to not create new hazards such as tripping or protrusions that might be a source of safety concern to pedestrians or passers by.

C. Establish reasonable alternative access when necessary due to placement of barriers.

D. Maintain barriers during entire construction period.

E. Relocate barriers as required by progress of construction.

3.2 TREE AND PLANT PROTECTION REQUIREMENTS

A. Preserve and protect existing trees and plants at site which are designed to remain, and those adjacent to site.

B. Consult with the Owner for removal of agreed-on roots and branches which interfere with construction.

1. Employ a qualified tree surgeon to remove, and to treat cuts.

C. Provide temporary barriers to a height of six feet, around each, or around each group, of trees and plants. The barriers shall be placed at the drip line of each tree.

D. Protect root zones of trees and plants:

1. Do not allow vehicular traffic or parking.

2. Do not store materials or products.

3. Prevent dumping of refuse or chemically injurious materials or liquids.

4. Prevent puddling or continuous running water.

E. Carefully supervise excavating, grading and filling, and subsequent construction operations, to prevent damage.

F. Replace, or suitably repair, trees and plants designated to remain which are damaged or destroyed due to construction operations. Any damage and any necessary replacements will be evaluated by F&S horticulturists.

3.3 DUST ENCLOSURES

A. Dust enclosures shall be continuous barriers with a rigid frame, made of clean materials, which will prevent dust from leaving work areas. Additionally, they may be required to resist noise and fumes as necessitated by contractors work plan.

3.4 REMOVAL

A. Completely remove barricades, including foundations, when construction has progressed to the point that they are no longer needed, and when approved by the Architect.

B. Clean and repair damage caused by installation, fill and grade areas of the site to required elevations and slopes, and clean the area.

END OF SECTION 01 56 00

1. GENERAL

1.1 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements for substitutions.

1.2 SUBSTITUTIONS

A. Base Bid shall be in accordance with the Contract Documents.

B. Substitution requests prior to bidding shall be submitted to Architect, in writing, a minimum of ten (10) days prior to bid date.

C. After the end of the bidding period, substitution requests will be considered only in case of:

1. Product unavailability
2. Other conditions beyond the control of the Contractor

D. Substitution Requests: Submit PDF electronic file of each request submitted for consideration. Identify product or fabrication or installation method to be replaced. Submit requests for substitutions on attached form. Submit a separate request form for each substitution. Include Specification Section number, title, and Drawing numbers and titles. Support each request with the following information:

1. Complete data substantiating compliance of proposed substitution with requirements stated in Contract Documents:

a. Product identification, including manufacturer's name and address.
b. Manufacturer's literature, identifying:

1) Product description
2) Reference standards
3) Performance and test data

2. Itemized comparison of the proposed substitution with product specified, listing significant variations.
3. Data relating to changes in construction schedule.
4. Effects of substitution on separate contracts.
5. List of changes required in other work or products.
6. Accurate cost data comparing proposed substitution with product specified.

a. Amount of net change to Contract Sum

7. Designation of required license fees or royalties.
8. Designation of availability of maintenance services sources replacement materials.

E. Substitutions will not be considered for acceptance when:

1. A substitution is indicated or implied on shop drawings or product data submittals without a formal request from the Contractor.
2. Acceptance will require substantial revision of Contract Documents.
3. In judgment of the Architect, the substitution request does not include adequate information necessary for a complete evaluation.
4. Requested directly by a Subcontractor or supplier.

F. Substitutions for Convenience: Not allowed

G. Do not order or install substitute products without recommendation of the Architect and acceptance by the Owner/Using Agency.

H. Architect will determine acceptability of proposed substitutions.

I. No verbal or written approvals other than by Change Order will be valid.

1.3 CONTRACTOR'S REPRESENTATION

A. In making formal request for substitution the Contractor represents that:

1. The proposed product has been investigated and it has been determined that it is equivalent, or superior, in all respects to the product specified.
2. The same warranties or bonds will be provided for the substitute product as for the product specified.
3. Coordination and installation of the accepted substitution into the Work will be accomplished and changes as may be required for the Work to be complete will be accomplished.
4. Claims for additional costs caused by substitution which may subsequently become apparent will be waived by the Contractor.
5. Complete cost data is attached and includes related costs under the Contract, but not:

a. Costs under separate contracts.
b. Architect's costs for redesign or revision of Contact Documents.

1.4 REQUEST FOR SUBSTITUTION FORM

A. 01 62 04.1 – Substitution Request Form

B. Substitutions will be considered only when the substitution form is completed and included with the request for substitution submittal and back-up data.

2. PRODUCTS

(NOT APPLICABLE)

3. EXECUTION

(NOT APPLICABLE)

END OF SECTION 01 62 04

REQUEST FOR SUBSTITUTION FORM

Note: Use separate form for each material, product, or equipment item.

Date: _____ Request No.: _____

Project: _____

Location: _____

Name of material, product, or equipment item submitted as substitution:

_____

Name of material, product, or equipment item specified:

_____

Specification Section _____, Article _____, Paragraph_____

Qualities that differ from specified product or system: _____

_____

_____

_____

_____
Name of Manufacturer/(Fabricator):

_____
Address

_____ (_____) _____
City, State, and Zip Telephone

_____

Name of Vendor/Supplier

_____

Address

_____ (_____) _____

City, State, and Zip Telephone

Reason for requesting substitution: _____

_____

_____

Substitution affects other materials or systems, such as dimensional revisions, redesign of structure, or modifications to other work:

_____ No

_____ Yes; describe requirements:

_____

_____

_____

If substitution requires modifications to dimensions indicated on drawings, are such modifications clearly indicated on attached data?

_____ Yes

_____ No; if no, explain: _____

Substitution has an effect on construction schedule:

_____ No

_____ Yes; describe effect on schedule:

_____

_____

_____

Savings or credit to Contract Amount for accepting substitute:

_____

_____Dollars ($_____)
Written Amount Amount in Figures

The attached data is furnished herewith for evaluation of the substitution:

Product Data _____, Drawings _____, Samples _____, Tests _____, Reports _____

Other Information _____

The undersigned hereby certifies:

1. The proposed substitution has been fully investigated and is equal or superior to specified product.

2. The same or better warranty will be furnished for proposed substitution as for specified material, product or equipment.

3. All changes in the work resulting from the use of this substitution, if approved, will be coordinated and completed in all respects and all costs, including, but not limited to, those for additional services rendered by the Architect are the responsibility of this Contractor at no additional cost to the Contract.

_____ _____
Contractor Signed by

_____
Address

_____
City, State, and Zip

For Use by Architect:
____Recommend
____Not Recommended
____Insufficient Data
____Recommend as Noted
____Received Too Late

By:_____
Date: _____

For Use by Owner:
____Approved
____Not Approved
____Approved as Noted

By: _____
Date: _____

END OF FORM

DIVISION 1 - GENERAL REQUIREMENTS
Section - 01 66 00 - Storage & Protection

1. GENERAL

A. REQUIREMENTS INCLUDE

1. General Contractor make arrangements with Owner for storage of materials and equipment to be installed in project. Protection and security for stored materials and equipment, on and off site is solely contractor's responsibility.

B. OFF-SITE AUTHORIZATION. Payment for materials/equipment stored off-site will be permitted only on prior written authorization, proof of insurance is submitted, and the material is stored in an independent warehouse under the owner's name and paid for by the contractor.

C. SUBMITTALS.

1. In accordance with Section 01 33 23, submit:

a. Request for allocation of storage space.
b. List of materials and equipment to be stored.
c. Proposed location for storage.
d. Special storage requirements.
e. Schedule of anticipated storage dates.

2. PRODUCTS

A. PROTECTIVE MATERIALS

1. For duration of storage period, provide materials which will provide proper protection against the elements or other harmful environmental conditions.

3. EXECUTION

A. LOCATION

1. Where authorized by Owner.

2. Contractor will resolve conflicts in storage requirements of all subcontractors.

B. PROTECTION

1. Appropriate protection is required as necessary to maintain quality and intent of stored materials.

END OF SECTION 01 66 00

DIVISION 1 - GENERAL REQUIREMENTS
Section - 01 73 29 - Cutting & Patching

1. GENERAL

1.1 REQUIREMENTS INCLUDE

A. Unless noted otherwise, each contractor shall:

1. Execute cutting (including excavating), filling or patching of work to:

a. Install specified work.
b. Remove samples of installed work specified for testing.
c. Remove and replace defective work.

2. In addition, upon written instructions of Architect/Engineer:

a. Uncover work to provide for observation of covered work.
b. Remove samples of installed materials for testing.
c. Remove work to provide for alteration of existing work.

3. Do not cut or alter work of another contractor without written consent of Architect/Engineer.

1.2 SUBMITTALS

A. Prior to cutting which affects structural members or work of another contractor, submit written notice to Architect/Engineer requesting consent to proceed with cutting, including:

1. Project identification.
2. Description of affected work.
3. Necessity for cutting.
4. Effect on other work, on structural integrity of project.
5. Description of proposed work. Designate:

a. Scope of cutting and patching.
b. Contractor and Crafts to execute the work.
c. Products proposed to be used.
d. Extent of refinishing.

6. Alternatives to cutting and patching.
7. Designation of party responsible for cost of cutting and patching.

B. Prior to cutting and patching done on instruction of Architect/ Engineer, submit cost estimate.

C. When conditions of work, or schedule, indicate change of materials or methods, submit recommendation to Architect/Engineer, including:

1. Condition indicating change.
2. Recommendation for alternative materials or methods.
3. Submittals specified for substitutions.

D. Submit written notice to Architect/Engineer, designating time work will be uncovered, to provide for observation.

1.3 PAYMENT FOR COSTS

A. Costs caused by ill-timed or defective work, or work not conforming to contract documents, including costs for additional services of Architect/Engineer: Party responsible for ill-timed, rejected or non-conforming work.

B. Work done on instructions of Architect/Engineer (by change order only), other than defective or non-conforming work: Owner

2. PRODUCTS

2.1 MATERIALS. For replacement of work removed: Comply with specifications for type of work to be performed.

3. EXECUTION

3.1 INSPECTION

A. Inspect existing conditions of work, including elements subject to movement or damage during:

1. Cutting and patching.
2. Excavating and backfilling.

B. After uncovering work, inspect conditions affecting installation of new products.

3.2 PREPARATION

A. Prior to cutting:

1. Provide shoring, bracing and support to maintain structural integrity of project.
2. Provide protection for other portions of the project.
3. Provide protection from elements.

3.3 PERFORMANCE

A. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances, finishes.

B. Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs and new work.

C. Restore work which has been cut or removed; install new products to provide completed work in accord with contract documents.

D. Refinish entire surfaces to provide an even finish.

E. Continuous surfaces: To nearest intersection(s).

F. Assembly: Entire refinishing.

END OF SECTION 01 73 29

DIVISION 1 - GENERAL REQUIREMENTS
Section - 01 74 13 - Construction Cleaning

1. GENERAL

1.1 REQUIREMENTS INCLUDE

A. General Contractor: Supervise and coordinate cleaning operations.

1.2 RELATED REQUIREMENTS

A. Specified elsewhere:

1. Individual Specification Sections: specific cleaning for product or work.
2. Section 01 35 16 – Remodeling Project Procedures

2. PRODUCTS

2.1 EQUIPMENT

A. As designated in individual specification sections.

3. EXECUTION

3.1 CLEANING

A. As designated in individual specification sections.

3.2 DISPOSAL

A. Maintain individual disposal units for sorting of debris for recycling and general disposal.

B. Properly dispose of all contents of dumpsters off site in an environmentally friendly manner and in compliance with local, state and federal regulations.

C. No burning of debris or materials is acceptable on site.

D. All hazardous materials shall be disposed of off-site in an EPA approved facility.

END OF SECTION 01 74 13

DIVISION 1 - GENERAL REQUIREMENTS
Section - 01 74 23 - Final Cleaning

1. GENERAL

1.1 REQUIREMENTS INCLUDE

A. General Contractor: Provide final cleaning:

1. At completion of work, or at such other times as directed by the Contractor, remove all waste, debris, rubbish, tools, equipment, machinery and surplus materials. Clean all sight exposed surfaces; leave work clean and ready for occupancy.

1.1 RELATED REQUIREMENTS

A. Specified elsewhere:

1. Section 01 74 13 - Construction Cleaning.

2. PRODUCTS

2.1 All products shall be environmentally friendly “Green” cleaning products.

3. EXECUTION

3.1 FINAL CLEANING

A. Employ experienced workmen for final cleaning.

B. Remove grease, dust, dirt, stains, labels, fingerprints, protection and other foreign materials from sight-exposed finished surfaces; polish surfaces so designated to specified finish.

1. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed surfaces, and of concealed spaces to ensure performance.

C. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.

D. Contractor soft broom clean all exposed concrete surfaces clean; other paved areas with soft or stiff broom as directed. Rake clean other surfaces on grounds.

E. Contractor to replace air handling filters if units were not protected during construction and shown to have construction dust/debris.

F. Contractor maintain finally cleaned areas until project, or designated portion thereof, is accepted by A/E.

END OF SECTION 01 74 23

DIVISION 1 - GENERAL REQUIREMENTS
Section - 01 78 36 - Warranties & Bonds

1. GENERAL

1.1 REQUIREMENTS INCLUDE

A. Each Contractor shall warrant their work in accordance with the Standard Documents for Construction. In addition, the following Warranties and Bonds shall be provided as specified.

B. Champaign County will be the designated agent during the warranty period.

2. PRODUCTS

A. Warranties and Bonds. Include the following:
1. Warranty and/or bond.
2. List of circumstances and conditions that would affect validity of warranty or bond.

3. EXECUTION (NOT APPLICABLE)

END OF SECTION 01 78 36

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Floors and slabs.

C. Concrete reinforcement.

D. Joint devices associated with concrete work.

E. Miscellaneous concrete elements

F. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 07 9005 - Joint Sealers: Sealants for saw cut joints and isolation joints in slabs.

1.03 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; American Concrete Institute International; 2010.

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).

C. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2010.

D. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (errata 2007).

E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.

F. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 2010.

G. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 2010.

H. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001 (Reapproved 2008).

I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2008.

J. ACI 347 - Guide to Formwork for Concrete; American Concrete Institute International; 2004.

K. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

L. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2009b.

M. ASTM C33 - Standard Specification for Concrete Aggregates; 2011.

N. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2010.

O. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2011.

P. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2010a.

Q. ASTM C150 - Standard Specification for Portland Cement; 2011.

R. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2010b.

S. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

T. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2008a.

U. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2009.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

C. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

D. Shop Drawings for reinforcement.

E. Concrete Mix Design Data.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI 347 to provide formwork that will produce concrete complying with tolerances of ACI 117.

B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
   2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
   3. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M Grade 60 (420).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished, unless otherwise indicated.

B. Reinforcement Accessories:

1. Tie Wire: Annealed, minimum 16 gage.
2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal Portland type.

B. Fine and Coarse Aggregates: ASTM C 33. Maximum aggregate size shall be 3/4".

C. Fly Ash: ASTM C618, Class C or F.

D. Water: Clean and not detrimental to concrete.

2.04 CHEMICAL ADMIXTURES

A. Water Reducer: ASTM C494, Type A

B. Calcium chloride or admixtures containing any form of chloride are prohibited.

C. Use of accelerating admixtures is prohibited.

2.05 BONDING AND JOINTING PRODUCTS

A. Slab Isolation Joint Filler: 3/4 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

B. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.
   1. Products:
      a. W.R. Meadows, Inc; Speed-E-Joint: www.wrmeadows.com.

C. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt, 1/4 inch thick and 4 inches deep; tongue and groove profile.

2.06 CURING MATERIALS

A. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound, that dissipates within 3 to 5 weeks; complying with ASTM C309.
   1. Products:
      a. W.R. Meadows, Inc.; 1100-Clear: www.wrmeadows.com.
      b. Anti Hydro Internation, Inc.; Newark, NJ 07108; A-H #2 clear
      c. Sonneborn; Shokopee, MN 55379; Kure-N-Seal

B. Curing and Sealing Compound, High Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.

C. Water: Potable, not detrimental to concrete.

2.07 TRAFFIC COATING

A. Two component, polyurethane base coat, intermediate coat, and top coat wearing surface in accordance with manufacturer's recommendations.

2.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Normal Weight Concrete:

1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 psi.
2. Fly Ash Content: 20 percent of cementitious materials by weight.
3. Water / (Cement+Fly Ash) Ratio: Maximum 44 percent by weight. Site water addition is prohibited.
4. Total Air Content: 4% to 7% percent, determined in accordance with ASTM C173/C173M for exterior slab only.
5. Maximum slump: 4 inches
6. Superplasticizer shall be added to the mix to increase slump to a range of 6" to 8" and may be redosed. Superplasticizer shall meet the requirements of ASTM C494, Type F or G, second or third generation.

2.09 MIXING

A. Ready mixed concrete: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete. Provide special formwork to resist fluid pressures of superplasticized concrete.

B. Tolerance: 1/8" in ten feet in any plane or direction.

C. Verify that forms are clean and free of rust before applying release agent. Apply form release agents to forms prior to erection of reinforcement. Keep reinforcement clean of form release agent.

D. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

E. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

F. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concretecoverage required for protection.

B. Do not apply heat to reinforcing bars for bending or any other reasons.

C. Tie bar crossings to prevent reinforcement bar movement.

3.04 PLACING CONCRETE

A. Concrete can free fall up to three feet.

B. Place concrete at its final position.

C. Provide vibration. Do not over vibrate.

D. Never place concrete on frozen surfaces.

E. Temperature must be minimum 35 degrees and rising.

F. Place no concrete when temperature reaches 95 degrees or above.

G. Protect concrete from freezing. Remove and replace all frozen concrete.

H. Notify Architect not less than 24 hours prior to commencement of placement operations.

I. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

J. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

K. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary before depositing new concrete on or against concrete which has hardened, re-tighten forms, roughen surface of hardened concrete, remove foreign matter and laitance, and saturate surface with water.

L. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

A. Locate joints as indicated on the drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
   1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Contraction Joint Devices: Use preformed joint device, with top set flush with top of slab, or hand tool joints. Sawcutting is prohibited.

E. Separate slabs on grade from vertical surfaces with joint filler.

F. Install expansion joints at right angles to concrete surface; extend through full depth or thickness of concrete.

G. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

H. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07 9005 for finish joint sealer requirements.

I. Install joint devices in accordance with manufacturer's instructions.

J. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

K. Place concrete continuously between predetermined expansion, control, and construction joints.

L. Do not interrupt successive placement; do not permit cold joints to occur.

M. Screed floors level, maintaining surface flatness of maximum 1/8 inch in 10 ft.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/8 inch in 10 ft.

2. Under Seamless Resilient Flooring: 1/8 inch in 10 ft.
3. Under Carpeting: 1/8 inch in 10 ft.

B. Correct the slab surface if tolerances are less than specified.

C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Concrete Slabs: Slabs will be exposed and sealed. Float, mop, and trowel for smooth, dense finish. Concrete sealer and concrete curing compound must be compatible products with each other from manufacturer.

3.08 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
1. Normal concrete: Not less than 7 days.

C. Concrete sealer and concrete curing compound must be compatible products with each other from manufacturer.

D. Surfaces Not in Contact with Forms:
1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
3. Final Curing: Begin after initial curing but before surface is dry.

3.09 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

E. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.

F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.10 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

END OF SECTION 03 30 00

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete Block

B. Brick Masonry

C. Mortar and Grout

D. Reinforcement and Anchorage

E. Flashings

F. Accessories

1.02 RELATED REQUIREMENTS

A. Section 05 1200 – Structural Steel

1.03 REFERENCE STANDARDS

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures; American Concrete Institute International; 2009.

B. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; 2008.

C. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

F. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2011.

G. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2006.

H. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2004.

I. ASTM C150 - Standard Specification for Portland Cement; 2011.

J. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006.

K. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2010.

L. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2010.

M. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2007.

N. ASTM C476 - Standard Specification for Grout for Masonry; 2010.

O. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete; 2010.

P. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.

1.04 SUBMITTALS

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar.

C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16” long x 8” tall and nominal depths as indicated on the drawings for specific locations.
   2. All Concrete Block Units: ASTM C90, Hollow core load bearing, Grade N, Type 1, normal weight.

2.02 BRICK MASONRY

A. ASTM C216, Type FBS, Grade SW1. Color and texture shall be selected by the Architect.

2.03 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I; color as required to produce approved color sample. Use of masonry cements is prohibited.
   1. Hydrated Lime: ASTM C207, Type S.
   2. Mortar Aggregate: ASTM C144.
   3. Grout Aggregate: ASTM C404.

B. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979.
   1. Color(s): As selected by Architect from manufacturer's full range.

C. Use of calcium chlorides or admixtures containing chlorides are prohibited.

D. Water: Clean and potable.

2.04 REINFORCEMENT AND ANCHORAGE

A. Manufacturers of Joint Reinforcement and Anchors:
   1. Hohmann & Barnard, Inc (including Dur-O-Wal brand): www.h-b.com.
   2. WIRE-BOND: www.wirebond.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Single Wythe Joint Reinforcement: Truss type; ASTM A 82/A 82M steel wire, hot dip galvanized after fabrication to ASTM A 153/A 153M, Class B; 3/16 inch minimum side rods with 9 gauge minimum cross rods; width as required to provide not more than 1 inch and not less than ½ inch of mortar coverage on each exposure.

C. Brick Anchors: 2-piece stainless steel anchors that permit differential movement between brick and structural backup.
   1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.

2. Wire ties: Triangular shape, 0.1875 inch thick.
3. Vertical adjustment: Not less than 3-1/2 inches.

2.05 FLASHINGS

A. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 24 gage thick; finish 2B to 2D.

B. Lap Sealant: Butyl type as specified in Section 07 9005.

2.06 ACCESSORIES

A. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; 3 inch wide x by maximum lengths available.

B. Weeps: Polyethylene tubing.

C. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

D. Sealants: Polyurethane base, multi-component

2.07 MORTAR AND GROUT MIXES

A. Mortar for Unit Masonry: ASTM C270, Type N using the Proportion Specification.

B. Grout: ASTM C476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches. Minimum 28 day compressive strength of 2,500 psi.

C. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
1. Bond: Running.
2. Coursing: One unit and one mortar joint to equal 8 inches.
3. Mortar Joints: Concave.

D. Brick Masonry:
   1. Bond: Running.
   2. Coursing: Three units and three mortar joints to equal 8 inches.
   3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Interlock intersections and external corners.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

H. Keep cavity clean of mortar.

3.06 WEEPS/CAVITY VENTS

A. Install weeps in veneer at 24 inches on center horizontally above through-wall flashing and at bottom of walls.

B. Install cavity vents in veneer at 32 inches on center horizontally below shelf angles and lintels.

3.07 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

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 continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

3.08 REINFORCEMENT AND ANCHORAGE

A. Install horizontal joint reinforcement 8 inches on center in all concrete block.

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 continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

3.09 REINFORCEMENT AND ANCHORAGE - BRICK

A. Install brick anchors @ 16 inches on center, vertical and horizontal.

B. Stud Back-Up: Secure brick anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 16 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.10 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
   2. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Extend metal flashings through exterior face of masonry and turn down to form drip. Install joint sealer below drip edge to prevent moisture migration under flashing.

C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

3.11 LINTELS

A. Install steel lintels over openings.

B. Maintain minimum 8 inch bearing on each side of opening.

3.12 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control and expansion joints. Bond beam reinforcement shall be continuous through control and expansion joints.

B. Form control joint with preformed joint filler, bond breaker, and sealant.

C. Size control joint in accordance with Section 07 9005 for sealant performance.

3.13 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.14 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, and sleeves. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.16 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION 04 22 00

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabrication of structural steel framing members, including structural steel support members which form part of the structural framing, hangers, miscellaneous angles, plates, and required bracing, welds, fasteners, and anchor bolts.

B. Delivery of structural steel to the designated job site.

C. Erection of steel framing members.

1.02 SUBMITTALS

A. Submit shop drawings in accordance with Section 01 33 00.

B. Indicate profiles, sizes, spacing, and locations of structural members, connections, attachments, fasteners, and identifying erection mark.

C. Indicate welded connections using standard AWS welding symbols. Indicate net weld length.

1.03 QUALITY ASSURANCE

A. Qualifications of suppliers and personnel:

1. The steel fabricator shall have not less than five years continuous experience in the fabrication of structural steel.

2. All welding shall be performed by operators who have been qualified as prescribed in “Qualification Procedure” of the American Welding Society. Certification may be checked under Testing Laboratory Services.

B. Codes and Standards:

1. AWS D1.1 – Structural Welding Code

2. AISC – Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, adopted 1978.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel shapes shall comply with ASTM A992.

B. Steel plates shall comply with ASTM A36.

C. Steel tubes shall comply with ASTM A500, Grade B.

D. Bolts, Nuts, and Washers: ASTM A325

E. Anchor Bolts: ASTM F1554, Grade 36, Galvanized.

F. Welding Electrodes: Filler metal for welding shall comply with AWS D1.1, Structural Welding Code, E70XX electrodes.

2.02 SURFACE CONDITIONS

A. Inspection:
1. Prior to installation of the work of this Section, carefully inspect the installed work of all other trades

and verify that all such work is complete to the point where the installation may properly commence.

2. Verify that structural steel may be fabricated and erected in strict accordance with the original design, the approved Shop Drawings, and the referenced standards.

B. Discrepancies:
   1. In the event of discrepancy, immediately notify the Architect.
   2. Do not proceed with fabrication in areas of discrepancy until all such discrepancies have been fully resolved.

2.03 FABRICATION

A. Fabricate all metal parts to comply with the design indicated on the Drawings. Make field measurements and prepare templates as required to insure proper fit. Assemblies shall be fitted together in the shop and delivered to the site complete and ready for installation.

B. Form metal shapes with sharp lines and angles, and finish with smooth surfaces. Shearings and punching shall be clean and true. In general, holes for bolts shall be drilled or reamed 1/16-inch larger than the diameter of the bolt.

C. Metal thicknesses, assembly details, and supports shall provide ample strength and stiffness. Joints shall be designed to prevent trapping of moisture.

D. Shop cleaning and painting:

   1. Shop paint all structural steel one coat, except:

      a. Steel to be encased in concrete

      b. Surfaces to be field welded.

      c. Contact surfaces to be high strength bolted.

E. Edges and corners

   1. Where plates, angles, and members are exposed and subject to touch, grind or nip sharp edges to render either bevel or radius and grind smooth free or burrs.

2.04 ERECTION

A. Erect structural steel in compliance with the AISC “Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings” and the AISC “Code of Standard Practice.”

B. Introduce and maintain temporary bracing and guying wherever necessary to withstand all loads to which structure may be subjected, including equipment and operation of same until permanent bracing and/or framing is installed.

C. Prior to assembling members, clean bearing surfaces and surfaces to be in permanent contact to remove dirt and scale.

D. Set members accurately to the lines and levels indicated on the Drawings and shop details. Unless otherwise indicated, individual pieces shall be erected so that the deviation from plumb, level, and alignment shall not exceed 1 to 500.

E. Do not field cut or alter members without the approval of the Architect/Engineer. Field welding is prohibited.

F. Drifting to enlarge holes will not be permitted. Holes that must be enlarged to admit bolts shall be reamed. Poor matching of holes caused by either shop or erection errors shall be sufficient cause for rejection by the Architect/Engineer.

G. After erection is complete, touch up all shop priming coats damaged during transportation and erection. Paint bolts and touch up all burned and abraded areas.

END OF SECTION 05 12 00

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel railings.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Manufacturer's product lines of mechanically connected railings.
2. Shop primer.
3. Bituminous paint.
4. Nonshrink, nonmetallic grout.
5. Anchoring cement.
6. Metal finishes.
7. Paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish.

D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For delegated-design professional engineer.

B. Welding certificates.

C. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

2.3 STEEL RAILINGS

A. Tubing: ASTM A500/A500M (cold formed)

B. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

C. Plates, Shapes, and Bars: ASTM A36/A36M.

D. Cast Iron Fittings: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

2.4 FASTENERS

A. Fastener Materials:

1. Ungalvanized-Steel Railing Components: Plated steel fasteners complying with ASTM F1941 (ASTM F1941M), Class Fe/Zn 5 for zinc coating.
2. Hot-Dip Galvanized Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.

B. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Shop Primers: Provide primers that comply with Section 09 91 13 "Exterior Painting".

E. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

F. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

G. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

H. Intermediate Coats and Topcoats: Provide products that comply with Section 09 91 13 "Exterior Painting."

I. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.

J. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.

K. Bituminous Paint: Cold-applied asphalt emulsion, complying with ASTM D1187/D1187M.

L. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

M. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations and where indicated on Drawings, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

A. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.

2. Remove sharp or rough areas on exposed surfaces.

B. Form work true to line and level with accurate angles and surfaces.

C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

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 flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.

D. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

E. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

F. Form changes in direction as follows:
1. By bending or by inserting prefabricated elbow fittings.

G. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

H. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

I. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
2. Coordinate anchorage devices with supporting structure.

J. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

2.7 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner and as follows.

1. Comply with SSPC-SP 16.

D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, hot-dip galvanize anchors to be embedded in exterior concrete or masonry.

E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with [**SSPC-SP 6/NACE No. 3.**] [**SSPC-SP 3.**] [**requirements indicated below:**

1. Exterior Railings: SSPC-SP 6/NACE No. 3.

F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1 for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated railings with universal shop primer indicated.
2. Do not apply primer to galvanized surfaces.

G. Shop-Painted Finish: Comply with Section 09 91 13 "Exterior Painting."

1. Color: Match Architect's sample.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.

1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
5. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.2 ANCHORING POSTS

A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with [**nonshrink, nonmetallic grout**] [**or**] [**anchoring cement**], mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with [**nonshrink, nonmetallic grout**] [**or**] [**anchoring cement**], mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Anchor posts to metal surfaces with flanges, angle type, or floor type, as required by conditions, connected to posts and to metal supporting members as follows:

D. Install removable railing sections, where indicated on Drawing, in slip-fit stainless steel sockets cast in concrete.

3.3 ATTACHING RAILINGS

A. Attach handrails to new cast-in-place concrete ramp as shown on the drawings.

B. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

3.4 CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 52 13

PART 1 - GENERAL

1.1 WORK INCLUDES:

A. General Contractor shall provide ALL labor, materials, equipment, and services necessary or incidental to the completion of all work of this section as shown, herein specified, or otherwise required.
   1. All preparations, primers, and finish materials.
   2. Protection of all finished painted surfaces, until final acceptance by the Using Agency.
   3. Complete cleanup of all painting materials and all surfaces, finished and not-finished, adjacent to finish painted surfaces.

1.2 RELATED WORK

A. Section 05 50 00 Metal Fabrications.

B. Section 05 52 13 Pipe and Tube Railings.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. 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. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

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 square.
   2. Step coats on Samples 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: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current “MPI Approved Products List” for each product category specified, with the proposed product highlighted.
3. VOC content.

1.5 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. Receive, store, and handle all materials as described in Section 01 66 00.
2. Maintain containers in clean condition, free of foreign materials and residue.
3. Maintain all container labels in a clean, readable, condition.
4. Remove all rags and waste materials daily.

1.6 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. Manufacturers: Subject to compliance with requirements, provide products by the following.

1. Benjamin Moore & Co.
2. Pittsburgh Paints
3. Sherwin-Williams

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are 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, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content: Provide materials that comply with VOC limits of the authorities having jurisdiction.

C. Colors: As selected on drawings by Architect from the manufacturer's full range.

2.3 EPOXY METAL PRIMERS

A. Sherwin-Williams: Macropoxy 646 Fast Cure Epoxy, B58-610 Series

B. Benjamin Moore: SuperSpec HP Epoxy Mastic, P45

C. PPG: Amerlock 400

2.6 ALIPHATIC ACRYLIC POLYURETHANE

A. Sherwin-Williams: Hi-Solids Polyurethane Semi-Gloss, B65-350 Series

B. Benjamin Moore: Super Spec HP Aliphantic Acrylic Urethane (P74)

C. PPG: Pitthane High Build Semi-Gloss Urethane

2.7 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Using Agency reserves the right to invoke the following procedure:

B. Using Agency may 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.

C. Testing agency will perform tests for compliance with product requirements.

D. Using Agency may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove non-complying 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.

D. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI 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.

C. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

D. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants. Where indicated on the drawings, remove all previous paint coats down to bare wood.

E. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

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 3, "Power Tool Cleaning."
2. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. 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 Manual."

B. Use applicators and techniques suited for paint and substrate indicated.

C. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

D. Paint both sides and edges of entire exposed surface.

E. 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.

F. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

G. 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.

I. Paint the following work where exposed to view:
1. Metals

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Using Agency may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

B. Contractor shall touch up and restore painted surfaces damaged by testing.

C. 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.

E. Where scaffolding is required to access work provide protection to adjacent surfaces and finishes to avoid spillage and spatters on surfaces. Where such scaffolding is suspended over entries or exits provide solid surface covering for protection against falling materials.

3.6 PAINTING SCHEDULE

A. Steel Substrates:

1. Epoxy/Urethane System
   a. Prime Coat: Polyamide Epoxy
   b. Two Coats: Aliphatic Acrylic Polyurethane Semi-Gloss

B. Galvanized-Metal Substrates:

1. Epoxy Urethane System:
   a. Prime Coat: Polyamide Epoxy
   b. Two Coats: Aliphatic Acrylic Polyurethane Semi-Gloss.

END OF SECTION 09 91 13

Satellite Jail Consolidation Project
ITB#2022-009
Proposed Schedule

September 1, 2022

Phase	Milestone Dates	Topic
Approvals - Facility Committee	09.06.2022	Facility Committee Approval of Bid Doc. ITB#2022-009
Approvals - County Board	09.22.2022	County Board Approval of PLA
Bidding	09.27.2022	Final Bid Document Ready and posted
Bidding	10.13.2022	Pre-Bid Conference and Tour of Satellite Jail -10am to 12noon – Brookens Shields Carter Meeting Room
Bidding	11.02.2022	Bid Opening – 2:00pm – Brookens Shields Carter Meeting Room
Contracts	11.17.2022	County Board Meeting – Approval of Award of Contract for ITB#2022-009
Contracts	11.30.2022	Contracts Signed and Insurance Waiver Delivered
Construction	12.01.2022	Notice to Proceed Issued

Preliminary

08/26/2022 3:55:30 PM

PROJECT MANUAL

CHAMPAIGN COUNTY
SATELLITE JAIL
JAIL CONSOLIDATION

ITB #2022-009 SATELITE JAIL CONSOLIDATION PROJECT

502 S. Lierman Ave.
Urbana, IL 61802

ISSUE FOR BIDS

VOLUME 1

REIFSTECK REID

DATE: SEPTEMBER 14, 2022

RRCo PROJECT #202190

PROJECT MANUAL FOR

CHAMPAIGN COUNTY SATELLITE JAIL
JAIL CONSOLIDATION
ITB #2022-009 SATELITE JAIL CONSOLIDATION PROJECT
502 S. Lierman Ave.
Urbana, IL 61802

DATE: SEPTEMBER 14, 2022 **ISSUE FOR BIDS**

VOLUME 1

VOLUME 2

VOLUME 3

VOLUME 4

MEP Specifier:
GHR Engineers & Associates Inc.
1615 S. Neil Street, Champaign, IL 61820
217.356.0536

SECTION 00 0115
LIST OF DRAWING SHEETS

VOLUME 1

G001	**VOLUME 1 COVER SHEET, SHEET LIST, PROJECT TEAM**
G101	**CODE REVIEW**
G102	**CODE PLAN**
C100	**CIVIL GENERAL INFORMATION**
C200	**TOPOGRAPHIC SURVEY**
C300	**OVERALL SITE PLAN**
C301	**NORTH ENLARGED SITE PLAN**
C302	**SOUTH ENLARGED SITE PLAN**
C400	**NORTH ENLARGED GRADING PLAN**
C401	**SOUTH ENLARGED GRADING PLAN**
C500	**UTILITY PLAN**
C501	**STORM SEWER PROFILES**
C502	**SANITARY SEWER PLAN & PROFILE**
C600	**CIVIL DETAILS**
C601	**CIVIL DETAILS**
C602	**CIVIL DETAILS**
C701	**SWPPP PLAN**
C702	**SWPPP DETAILS**
S001	**STRUCTURAL TITLE SHEET**
S101	**OVERALL FOUNDATION PLAN**
S102	**FOUNDATION PLAN – NORTH-EAST**
S103	**FOUNDATION PLAN – SOUTH-EAST**
S104	**FOUNDATION PLAN – WEST**
S105	**FOUNDATION PLAN – ALTERNATES #1 & #2**
S201	**OVERALL T.O. CELL FRAMING PLAN**
S202	**T.O. CELL FRAMING PLAN – NORTH-EAST**
S203	**T.O. CELL FRAMING PLAN – SOUTH-EAST**
S301	**OVERALL ROOF FRAMING PLAN**
S302	**ROOF FRAMING PLAN – NORTH-EAST**
S303	**ROOF FRAMING PLAN – SOUTH-EAST**
S304	**ROOF FRAMING PLAN – WEST**
S305	**ROOF FRAMING PLAN – ALTERNATES #1 & #2**
S306	**HIGH ROOF FRAMING PLAN**
S401	**STEEL JOIST PROFILES**
S402	**STEEL JOIST PROFILES**

S501 FOUNDATION DETAILS
S502 FOUNDATION DETAILS
S601 FRAMING DETAILS
S602 FRAMING DETAILS
S603 FRAMING DETAILS
S701 STRUCTURAL SCHEDULE
S702 STRUCTURAL SCHEDULES

AD101 DEMOLITION PLAN – FIRST FLOOR
AD201 DEMOLITION REFLECTED CEILING PLAN – FIRST FLOOR
A000 ABBREVIATIONS, SYMBOLS, NOTES
A101 OVERALL FLOOR PLAN
A111 PARTIAL DIMENSIONS FLOOR PLAN – NORTH-EAST
A112 PARTIAL DIMENSIONS FLOOR PLAN – SOUTH-EAST
A113 PARTIAL DIMENSIONS FLOOR PLAN & ANNOTATION FLOOR PLAN - WEST
A114 PARTIAL DIMENSIONS FLOOR PLAN & ANNOTATION ALTERNATE PLANS & ROOF PLAN
A131 ROOM FINISH SCHEDULE
A201 OVERALL REFLECTED CEILING PLAN
A211 PARTIAL REFLECTED CEILING PLAN – NORTH-EAST
A212 PARTIAL REFLECTED CEILING PLAN – SOUTH-EAST
A213 PARTIAL REFLECTED CEILING PLAN – WEST
A301 ROOF PLAN & DETAILS
A302 ROOF DETAILS
A401 BUILDING ELEVATIONS
A501 BUILDING SECTIONS & ELEVATIONS
A511 WALL SECTIONS
A512 WALL SECTIONS, DETAILS, ALTERNATE #1
A601 ENLARGED FLOOR PLANS & INTERIOR ELEVATIONS
A602 STAIR PLANS, SECTIONS & DETAILS
A603 DESK & CABINETRY PLANS & ELEVATIONS
A711 PLAN DETAILS
A721 MISC. DETAILS
A801 DOOR & GLAZED SCHEDULES
A802 DOOR & GLAZED FRAME TYPES

QD101 OVERALL DETENTION EQUIPMENT PLAN
QD111 PARTIAL DETENTION EQUIPMENT FLOOR PLAN – NORTH-EAST
QD112 PARTIAL DETENTION EQUIPMENT FLOOR PLAN – SOUTH-EAST
QD113 PARTIAL DETENTION EQUIPMENT FLOOR PLAN - WEST
QD601 DETENTION EQUIPMENT ENLARGED PLANS, INTERIOR ELEVATIONS
QD701 DETENTION EQUIPMENT DETAILS
QD801 DETENTION EQUIPMENT DOOR & GLAZED FRAME SCHEDULES

QD802 DETENTION EQUIPMENT DOOR & GLAZED FRAME TYPES
QD803 DETENTION EQUIPMENT DOOR & GLAZED FRAME DETAILS
QD804 DETENTION EQUIPMENT DOOR & GLAZED FRAME DETAILS
QD805 DETENTION EQUIPMENT DOOR & GLAZED FRAME DETAILS
QD806 DETENTION EQUIPMENT DOOR DETAILS
QD807 EXTERIOR DOOR & GLAZED FRAME DETAILS

VOLUME 2

G002 VOLUME 2 COVER SHEET

FP111 FLOOR PLAN, NORTH-EAST – FIRE PROTECTION
FP112 FLOOR PLAN, SOUTH-EAST – FIRE PROTECTION
FP113 FLOOR PLAN, WEST – FIRE PROTECTION
FP201 FIRE PROTECTION SECTIONS

P101 FOUNDATION PLAN, NORTH-EAST – PLUMBING
P102 FOUDNAITON PLAN, SOUTH-EAST – PLUMBING
P111 FLOOR PLAN, NORTH-EAST – PLUMBING
P112 FLOOR PLAN, SOUTH-EAST – PLUMBING
P113 FLOOR PLAN, WEST-PLUMBING
P120 ROOF PLAN – PLUMBING
P301 PLUMBING SCHEDULES
P401 PLUMBING DETAILS
P402 PLUMBING DETAILS

H111 FLOOR PLAN, NORTH-EAST – HEATING
H112 FLOOR PLAN, SOUTH-EAST – HEATING
H113 FLOOR PLAN, WEST – HEATING
H114 GEOTHERMAL FIELD LAYOUT
H301 HEATING SCHEDULES
H401 HEATING DETAILS

HV000 HVAC SYMBOLS & ABBREVIATIONS
HV131 ROOF PLAN – HVAC
HV201 ENLARGED FLOOR PLANS & SECTIONS

V111 FLOOR PLAN, NORTH-EAST – VENTILATING
V112 FLOOR PLAN, SOUTH-EAST – VENTILATING
V113 FLOOR PLAN, WEST – VENTILATING
V301 VENTILATING SCHEDULES
V401 VENTILATING DETAILS

ED111 DEMOLITION FLOOR PLAN, NORTH-WEST – ELECTRICAL
ED112 DEMOLITION FLOOR PLAN, SOUTH-WEST – ELECTRICAL
E000 ELECTRICAL NOTES & SYMBOLS
E101 ELECTRICAL SITE PLAN
E301 ELECTRICAL SCHEDULES
E302 ELECTRICAL SCHEDULES
E401 ELECTRICAL DETAILS
E501 ELECTRICAL ON-LINE DIAGRAM
E801 ELECTRICAL PLAN SCHEDULES
E802 ELECTRICAL PANEL SCHEDULES
E803 ELECTRICAL PANEL SCHEDULES

EL111 FIRST FLOOR PLAN, NORTH-EAST – LIGHTING
EL112 FIRST FLOOR PLAN, SOUTH-EAST – LIGHTING
EL113 FLOOR PLAN, WEST – LIGHTING
EL121 MEZZANINE LEVEL PLAN, NORTH-EAST – LIGHTING
EL122 MEZZANINE LEVEL PLAN, SOUTH-EAST – LIGHTING

EP111 FLOOR PLAN, NORTH-EAST – POWER
EP112 FLOOR PLAN, SOUTH-EAST – POWER
EP113 FLOOR PLAN, WEST – POWER
EP131 ROOF PLAN – POWER
EP132 ROOF PLAN – LIGHTNING PROTECTION

ES111 FLOOR PLAN, NORTH-EAST – SYSTEMS
ES112 FLOOR PLAN, SOUTH-EAST – SYSTEMS
ES113 FLOOR PLAN, WEST – SYSTEMS
ES121 MEZZANINE LEVEL PLAN, NORTH-EAST – SYSTEMS
ES122 MEZZANINE LEVEL PLAN, SOUTH-EAST - SYSTEMS

TD113 DEMOLITION FLOOR PLAN, WEST – TECHNOLOGY
T000 TECHNOLOGY NOTES & SYMBOLS
T111 FLOOR PLAN, NORTH-EAST – TECHNOLOGY
T112 FLOR PLAN, SOUTH-EAST – TECHNOLOGY
T113 FLOOR PLAN, WEST – TECHNOLOGY
T301 TECHNOLOGY SCHEDULES & RISERS
T401 TECHNOLOGY DETAILS

SD113 DEMOLITION FLOOR PLAN, NORTH-WEST – SECURITY
SD114 DEMOLITION FLOOR PLAN, SOUTH-WEST – SECURITY
SD115 DEMOLITION MEZZANINE FLOOR PLAN, NORTH-WEST – SECURITY

SD116 DEMOLITION MEZZANINE FLOOR PLAN, SOUTH-WEST - SECURITY

SC000 SECURITY NOTES & SYMBOLS
SC111 FLOOR PLAN, NORTH-EAST – SECURITY
SC112 FLOOR PLAN, SOUTH-EAST – SECURITY
SC113 FLOOR PLAN, NORTH-WEST – SECURITY
SC114 FLOOR PLAN, SOUTH-WEST – SECURITY
SC121 MEZZANINE FLOOR PLAN, NORTH-WEST – SECURITY
SC122 MEZZANINE FLOOR PLAN, SOUTH-WEST – SECURITY
SC201 ENLARGED FLOOR PLANS – EXISTING BUILDING – SECURITY
SC202 ENLARGED FLOOR PLANS – BOOKING & PODS C & D - SECURITY
SC301 SECURITY SCHEDULES & RISERS
SC302 SECURITY RISERS
SC303 SECURITY RISERS
SC304 SECURITY RISERS

END OF SECTION

SECTION 00 1113

ADVERTISEMENT FOR BIDS

FROM:

1.01 THE OWNER (HEREINAFTER REFERRED TO AS OWNER):

A. Champaign County

B. Project Address:
502 S Lierman Ave.
Urbana, IL 61802

1.02 AND THE ARCHITECT (HEREINAFTER REFERRED TO AS ARCHITECT):

A. Reifsteck Reid & Company Architects

B. Address:
909 Arrow Road
Champaign, IL 61821

1.03 DATE: SEPTEMBER 14, 2022

1.04 TO: POTENTIAL BIDDERS

A. The Owner invites submission of bids under seal to the Owner for construction of a building addition to the Champaign County Jail located at the above address. Bids are due at ____ before 2:00 pm local standard time on the _____ day of November, 2022, after which the bids will be opened and read aloud publicly. Sealed bids shall be clearly idenfitied with the project title: "Champaign County Jail Consolidation".

B. All bidders are required to prequalify to the requirements described in Document 00 2113 - Instructions to Bidders.

C. Project Description: Construct an approximately 27,000 SF single story addition to the existing Champaign County Jail.

D. Bid Documents for a Stipulated Sum contract may be obtained from the office of the Design Professional upon receipt of a refundable deposit, by cash, check or CIB card, in the amount of $_____ for one set. Contractors may be mailed sets for a separate non-refundable $****.00 fee. No partial sets will be distributed. Deposit checks will be returned to Bidders who return the contractor documents to the Architect in good conditions, within ten (10) days after the opening of bids. Electronic copies may be obtained free of charge through Reifsteck Reid's Sharefile website, located at:
1. http://rr-arch.sharefile.com/**********

E. Bidders will be required to provide Bid security in the form of a Bid Bond in the amount of $_____.

F. A 100% Performance/Payment Bond will be required.

G. **PREVAILING WAGES:** Contractors will be required to comply with all laws, including those relating to prevailing rate of wages of the various classes of work to be performed under the proposed contract as determined by the Illinois Department of Labor, in accordance with Federal Labor Standards provisions, US Department of Labor.

H. Work is Tax Exempt.

I. Refer to other bidding requirements described in Document 00 2113 - Instructions to Bidders.

J. Submit your offer on the Bid Form provided. Bidders may supplement this form as appropriate.

K. Bids received after the stated time will not be accepted, and will be returned unopened.

L. Your offer will be required to be submitted under a condition of irrevocability for a period of 30 days after submission.

M. The Owner reserves the right to accept or reject any or all offers.

END OF SECTION

SECTION 00 2113

INSTRUCTIONS TO BIDDERS

SUMMARY

INVITATION

2.01 BID SUBMISSION

A. Bids signed and under seal, executed, and dated will be received at the office of the Architect at _____ before _____ a.m. local standard time on mm-dd-yyyy.

B. Offers submitted after the above time will be returned to the bidder unopened.

C. Offers will be opened publicly immediately after the time for receipt of bids.

2.02 INTENT

A. The intent of this Bid request is to obtain an offer to perform work to complete project named Champaign County Jail Consolidation for a Stipulated Sum contract, in accordance with Contract Documents.

2.03 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

A. Work of this proposed Contract comprises at minimum building construction, site development, renovation, and selective demolition, including general construction, structural, mechanical, electrical, and plumbing Work, and including fire protection and detention work.

B. Project Location:
   502 S Lierman Ave..
   Urbana, IL 61802.

2.04 CONTRACT TIME

A. The bidder, in submitting an offer, accepts the Contract Time period stated for performing the Work. The completion date in the Agreement shall be the Contract Time added to the commencement date. The bidder may suggest a revision to the Contract Time with a specific adjustment to the Bid Amount.

BID DOCUMENTS AND CONTRACT DOCUMENTS

3.01 DEFINITIONS

A. Bid Documents: Contract Documents supplemented with Invitation To Bid, Instructions to Bidders, Information Available to Bidders, Bid Form Supplements To Bid Forms and Appendices and Bid securities identified.

B. Contract Documents: Defined in AIA A201 Article 1 including issued Addenda.

C. Bid, Offer, or Bidding: Act of submitting an offer under seal.

D. Bid Amount: Monetary sum identified by the Bidder in the Bid Form.

3.02 CONTRACT DOCUMENTS IDENTIFICATION

A. The Contract Documents are identified as Project Number 202190, as prepared by Architect, and with contents as identified in the Table of Contents.

3.03 AVAILABILITY

A. Bid Documents may be obtained at the office of Architect for deposits and fees as identified in 00 1113 -Advertisement for Bids. No partial sets will be distributed.

B. Bid documents may be viewed and obtained electronically free of charge at the Reifsteck Reid & Company Project Sharefile website:
   1. https://rr-arch.sharefile.com**********.

C. Deposit will be refunded if Bid Documents are returned complete, undamaged, unmarked and reusable, within 10 days of bid submission. Failure to comply will result in forfeiture of deposit.

D. Bid Documents are made available only for the purpose of obtaining offers for this project. Their use does not grant a license for other purposes.

3.04 EXAMINATION

A. Bid Documents may be viewed free of charge electronically at the Project Sharefile website listed above.

B. Upon receipt of Bid Documents verify that documents are complete. Notify Architect should the documents be incomplete.

C. Immediately notify Architect upon finding discrepancies or omissions in the Bid Documents.

3.05 INQUIRIES/ADDENDA

A. Direct questions to Chris Bieser, Project Manager, email; cbieser@rr-arch.com.

B. Addenda may be issued during the bidding period. All Addenda become part of Contract Documents. Include resultant costs in the Bid Amount.

C. Verbal answers are not binding on any party.

D. Clarifications requested by bidders must be in writing not less than 7 days before date set for receipt of bids. The reply will be in the form of an Addendum, a copy of which will be forwarded to known recipients. Receipt of addenda shall be acknowledge by the bidder in the space provided in the Bid Form.

SITE ASSESSMENT

4.01 SITE EXAMINATION

A. Examine the project site before submitting a bid.

B. A visit to the project site has been arranged for bidders as part of the prebid conference. Bidders are encouraged to attend.

4.02 PREBID CONFERENCE

A. A bidders conference has been scheduled for _____ a.m. on the _____ day of October 2022 at the location of _____.

B. All general contract bidders and suppliers are invited.

C. Representatives of Architect will be in attendance.

D. Summarized minutes of this meeting will be circulated to attendees. These minutes will not form part of Contract Documents.

E. Information relevant to the Bid Documents will be recorded in an Addendum, issued to Bid Document recipients.

QUALIFICATIONS

5.01 EVIDENCE OF QUALIFICATIONS

A. To demonstrate qualification for performing the Work of this Contract, bidders may be requested to submit written evidence of financial position, license to perform work in the State.

B. See Section 00 2114 DETENTION EQUIPMENT CONTRACTOR (DEC) QUALIFICATIONS.

C. See Section 28 0001 QUALIFICATION PROCESS FOR DIVISION 28 for ESSS qualifications.

5.02 SUBCONTRACTORS/SUPPLIERS/OTHERS

A. Owner reserves the right to reject a proposed subcontractor for reasonable cause.

BID SUBMISSION

6.01 SUBMISSION PROCEDURE

A. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed.

B. Submit one copy of the executed offer on the Bid Forms provided, signed and sealed with the required security in a closed opaque envelope, clearly identified with bidder's name, project name and Owner's name on the outside.

C. Double Envelope: Insert the closed and sealed Bid Form envelope plus requested security deposit, qualification forms in a large opaque envelope and label this envelope as noted above.

D. Improperly completed information, irregularities in security deposit, may be cause not to open the Bid Form envelope and declare the bid invalid or informal.

E. An abstract summary of submitted bids will be made available to all bidders following bid opening.

6.02 BID INELIGIBILITY

A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the Owner, be declared unacceptable.

B. Bid Forms, Appendices, and enclosures that are improperly prepared may, at the discretion of Owner, be declared unacceptable.

C. Failure to provide security deposit, bonding or insurance requirements may, at the discretion of Owner, be waived.

BID ENCLOSURES/REQUIREMENTS

7.01 SECURITY DEPOSIT

A. Bids shall be accompanied by a security deposit as follows:
   1. Bid Bond of a sum no less than 5 percent of the Bid Amount on AIA A310 Bid Bond Form.

B. Endorse the Bid Bond in the name of the Owner as obligee, signed and sealed by the principal (Contractor) and surety.

C. The security deposit will be returned after delivery to the Owner of the required Performance and Payment Bond(s) by the accepted bidder.

D. Include the cost of bid security in the Bid Amount.

E. If no contract is awarded, all security deposits will be returned.

7.02 PERFORMANCE ASSURANCE

A. Accepted Bidder: Provide a Performance bond as described in 00 7300 - Supplementary Conditions.

B. Include the cost of Performance and Payment Bonds in the Bid Amount.

7.03 BID FORM REQUIREMENTS

A. Complete all requested information in the Bid Form and Appendices.

7.04 PERMITS

A. Contractor shall include in the Bid, the amount necessary to obtain the Building Permit for the entire project.

B. The contractor shall include in the Bid the cost for all other permits, inspection fees and similar charges imposed by government and quasi-governmental entities with jurisdiction, as may be required for all work to be performed for this project.

7.05 SALES AND USE TAXES

A. Illinois Sales Tax: Bidders hall not include Illinois Sales Tax on materials in Bid Amount.

B. Freight: All freight charges shall be included in Bid Amount.

C. License or Royalty Fees: If the project is designed to require or permit the use of processes, articles, apparatus or equipment of which licenses or royalty fees will be charged, fees shall be directly paid by Contractor to patentee, licensee, or Owner of such processes, and fees shall be included in the Bid Amount.

D. Escalation: All prices quoted must represent the entire cost in accordance with the Contract Documents and no subsequent claim will be recognized for any increase in wage scale, material prices, cost indexes, or other rates affecting the construction industry or this project.

7.06 FEES FOR CHANGES IN THE WORK

A. Include the fees for overhead and profit on own Work and Work by subcontractors, identified in Document 00 7300 - Supplementary Conditions .

B. Include in the Bid Form, the overhead and profit fees on own Work and Work by subcontractors, applicable for Changes in the Work, whether additions to or deductions from the Work on which the Bid Amount is based.

C. Include in the Bid Form, the fees proposed for subcontract work for changes (both additions and deductions) in the Work. Contractor shall apply fees as noted, to the subcontractor's gross (net plus fee) costs on additional work.

7.07 BID FORM SIGNATURE

A. The Bid Form shall be signed by the bidder, as follows:
   1. Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature. Affix seal.
   2. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature. Affix seal to each signature.
   3. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts, under each signature. Affix the corporate seal. If the bid is signed by officials other than the president and secretary of the company, or the president/secretary/treasurer of the company, a copy of the by-law resolution of their board of directors authorizing them to do so, must also be submitted with the Bid Form in the bid envelope.
   4. Joint Venture: Each party of the joint venture shall execute the Bid Form under their respective seals in a manner appropriate to such party as described above, similar to the requirements of a Partnership.

7.08 SELECTION AND AWARD OF ALTERNATES

A. Indicate variation of bid price for Alternates listed on the Bid Form. Unless otherwise indicated, indicate Alternates as a difference in bid price by adding to or deducting from the base bid price.

B. Bids will be evaluated on the total of the base bid price and all of the Alternates. After determination of the successful bidder, consideration will be given to which Alternates will be included in the Work.

OFFER ACCEPTANCE/REJECTION

8.01 DURATION OF OFFER

A. Bids shall remain open to acceptance and shall be irrevocable for a period of sixty (60) days after the bid closing date.

8.02 ACCEPTANCE OF OFFER

A. Owner reserves the right to accept or reject any or all offers.

B. It is the intent of the Owner to award a contract to the lowest responsible bidder provided the bid has been submitted in accordance with all requirements of the bidding documents, unless all bids are rejected. The Owner reserves the right, however, to award the Contract in his best interest, and therefore, reserves the right to select a Bidder other than the lowest.

C. After acceptance by Owner, Architect on behalf of Owner, will issue to the successful bidder, a written Notice To Proceed.

END OF SECTION

SECTION 00 2114

DETENTION EQUIPMENT CONTRACTOR (DEC) QUALIFICATIONS

PART 1 GENERAL

1.01 QUALIFICATION PROCESS INCLUDES

Please provide the following information regarding your company's history and current status for consideration on upcoming detention projects:

A. The Detention Equipment Contractor, must submit a letter directly from their bonding insurance company, not from an insurance agent as it relates to your company in its current financial position. The letter should state the following factual information:
   1. The Detention Equipment Contractor shall have their Bonding Insurance Company list their total aggregate bonding line along with their highest individual bond for a detention project.
   2. Grounds for disqualification for the Detention Equipment Contractor Shall exist if it is proven that the information submitted is inaccurate or fails to satisfy the requirements for this project.

B. Any Detention Equipment Contractor who intends to submit a bid on this section of the Specifications shall submit the following data to the Architect in writing within two (2) weeks of receipt of this qualification package. The Architect, the Owner, other officials, and the Construction Manager (if involved in pre-bid) shall review the submittals and references, including past projects not listed, and select the Detention Contractors that will be approved to bid. Approved DECs shall be listed in a project addendum. All decisions are final. Grounds for disqualification shall exist if it is proven that the information submitted is intentionally inaccurate or, in the opinion of the Architect and or the Construction Manager, fails to satisfy the requirements set forth herein.

C. Provide a narrative and historical description of the firm from inception, including the history of ownership, partnership, incorporation, and/or other organizational information. Include information on the growth of the firm over time including the number of employees, relocation(s) of the firm, major production equipment purchases, and replacements. Use only the current corporate or business entity, intending on bidding and performing the work, should it be awarded the work.

D. List the firm's business volume (a dollar amount) for the last five (5) fiscal years.

E. Provide a statement that the firm has been in business for a minimum of ten (10) continuous years and the principals and key personnel that have been engaged in successfully providing procurement, management, installation, and commissioning of security detention projects.

F. Provide a list of all employees in a supervisory capacity, stating their area of responsibility and their years of experience in that capacity.
   1. Number of years as a full-time employee of the Detention company
   2. Minimum years of Jail experience
   3. Completed training program for ironworkers (if involved with equipment installation)

G. Submit a list of ALL detention projects completed in the last ten (10) years.

H. Submit a list of ten (10) projects that this corporation under its current name and management, has built in the last five (5) years comparable in size and construction (list only projects in which prefabricated modular steel cell units were installed by your firm). Include in this list:
   1. Project Name, Owner, Contract Name, Address, Phone Number, and email address;
   2. Project Manager Name, Address, Phone Number, and email address;
   3. User Agency or Government entity Name, Address, Phone Number, and email address;
   4. Architect and Engineer of Record Name, Address, Phone Number, and email address;
   5. General Contractor and/or Construction Manager Name, Address, Telephone Number, and email address;
   6. Project delivery method (traditional, design/bid/build, design/build, Partnering, or other);
   7. Scope of the Project including the total number of cells, total project square footage;

8. Identify projects that used Modular Steel Cells, name of the cell manufacturer, note if cells were made with galvanized or galvanneal coated steel, and interior finish of cells (epoxy, polyurea, or powder coat);
9. Square Footage, the scope of products and services provided on that project by your company;
10. Total dollar amount of the DEC contract;
11. List the name(s) of the key installation foremen that are employees of your company, for each project.
12. List the key installation foreman for steel cell projects that work for your firm. Do not list employees from another installation company.
13. Include their names, contact information, and the list of projects they have completed as an employee of your firm.
14. Date of final completion and occupancy.

I. Provide a complete list of ALL current projects, and highlight those which utilize prefabricated modular steel cell units installed by your firm. For each project, provide the project name, location, architect name, and contact info, Construction Manager or General Contractor name and contact info, the quantity of modular units (if applicable), date of the contract or purchase order, start date, and current status including the quantity of modular units that have been delivered/installed, and the projected completion date for the remaining balance of prefab modular units.

J. Provide an audited financial statement from a recognized Certified Public Accountant for the three (3) past fiscal years. The format of the financial statement must be acceptable to surety for purpose of obtaining performance and payment bonds in an amount equal to the provided overall scope of work for the DEC, and the accompanying dollar value of this bid. This amount is $_____.

K. Submit a listing of all projects in which the company is presently or has been involved in litigation, as either plaintiff or defendant within the past five (5) years, and the status thereof. In addition to this statement, please respond to the following questions 1 through 8. For any "YES" answer to the following questions, please attach a separate sheet, which provides a brief explanation of the facts, names of the parties involved, the dollar amount being claimed from your firm, and the present status of the case. Attach explanations of any lawsuit alleging negligence of defective work, or breach of contract on part of the firm. Do not include lien matters, automobile accident cases, or workman's compensation cases:

1. Has a court issued a judgment of $100,000 or more against the firm or its predecessors in the past five (5) years?
   _____ YES _____ NO
2. Has the firm or its predecessors been party to the settlement of a lawsuit with a potential value of $100,000 or more?
   _____ YES _____ NO
3. Is the firm or its predecessors currently a party to a pending lawsuit with a potential value of $100,000 or more?
   _____ YES _____ NO
4. Within the past five years, has any key person, the firm or its predecessors defaulted on a loan?
   _____ YES _____ NO
5. Has the firm or its predecessors or any person of the firm or its predecessors ever been suspended or debarred by a state, federal or municipal agency?
   _____ YES _____ NO
6. Within the past five (5) years, has the firm or its predecessors been terminated on or failed to complete any contract?
   _____ YES _____ NO
7. Within the past five (5) years has the firm or the predecessors been responsible for significant delays in the completion of a project (over 3 weeks)?
   _____ YES _____ NO

8. Has the firm or its predecessor firm(s) been in Bankruptcy or receivership at any time during the past ten (10) years? If the answer is yes, provide the name of the company, the date of bankruptcy.
   _____ YES _____ NO
9. Has the firm or any of its predecessors ever been involved with a project in which liquidated damages were assessed to the firm in the last five (5) years? If the answer is yes, provide the name of the project, construction manager, security architect, and dollar amount of said damages.
   _____ YES _____ NO

L. Provide a complete list of any projects wherein your company has been involved in a bond claim against your company for non-performance. Include the amount of claim, details of the claim, and contact information (name, phone number, email address) for the Architect, Construction Manager/General Contractor, and the Owner.

M. Provide a complete list of any manufacturers, suppliers, or installers that have ever filed a claim against your company, any predecessor companies, or company principals for either non-performance or non-payment on any detention project. Include the dollar amount of the claim and the name of the company(s) and a contact name, phone number, and email address.

N. Submit for approval the names of the detention equipment manufacturers that you intend to purchase materials from. The manufacturers must be chosen from the design specifications or addendums. Alternate manufacturers will not be considered.
   1. Submit a current letter from the detention hardware manufacturer stating that your company is a trained, fully authorized distributor and installer of their complete line of products;
   2. Submit a current letter from the detention hollow metal door and frame manufacturer stating that you are a factory-trained, fully authorized distributor and installer for their complete line of products;
   3. Submit a current letter from the Modular Steel Cell Manufacturer stating that you are a factory-trained, fully authorized distributor and installer for their steel cells;
   4. Submit a current letter from the Security Window Manufacturer stating that you are a factory-trained, fully authorized distributor and installer for their windows;
   5. Submit a current letter from the Security Glass Manufacturer stating that you are a factory-trained, fully authorized distributor and installer for their windows;
   6. Submit a current letter from the Detention Furnishings Manufacturer stating that you are a factory-trained, fully authorized distributor and installer for their furnishings;
   7. Submit a letter directly from each manufacturer you intend to include in your bid, stating that you have a customary credit relationship with that manufacturer such that you may purchase equipment directly from that manufacturer;
   8. Demonstrate ongoing business relationships between your firm and approved (a.) lock manufacturer(s); (b.) hollow metal door manufacturers and (c.) Electronic Security Control Integrators covering not less than three (3) separate projects.

END OF SECTION

SECTION 00 3100

AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.01 EXISTING CONDITIONS

A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of Contract Documents, as follows:

B. Geotechnical Report: Entitled "Subsurface Exploration and Foundation Recommendations, Proposed Champaign County Jail Addition, MET Project No. C23006", dated March 29, 2022, prepared by Midwest Engineering and Testing, Inc. A copy of this report immediately follows this section.

C. Hazardous Material Survey: Entitled "Asbestos Inspection Report" and "Lead-Based Paint Inspection Report", dated February 8, 2022, prepared by Reliable Environmental Solutions, Inc. A copy of this report immediately follows this section.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 4100

BID FORM

THE PROJECT AND THE PARTIES

1.01 TO:

A. Owner

1.02 FOR:

A. _____

1.03 DATE: _____ (BIDDER TO ENTER DATE)

1.04 SUBMITTED BY: (BIDDER TO ENTER NAME AND ADDRESS)

A. Bidder's Full Name _____
   1. Address _____
   2. City, State, Zip_____
   3. Email_____

1.05 OFFER

A. Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by Reifsteck Reid & Company Architects for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

B. _____ _____ dollars ($_____), in lawful money of the United States of America.

C. We have included the required security deposit as required by the Instruction to Bidders.

D. We have included the required performance assurance bonds in the Bid Amount as required by the Instructions to Bidders.

E. All applicable federal taxes are included and State of Illinois taxes are included in the Bid Sum.

F. By signing this bid/proposal, the bidder/proposer certifies, and in the case of a joint bid/proposal communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder/proposer or with any competitor.

G. Unless otherwise required by law, the prices which have been quoted in this bid/proposal have not been knowingly disclosed by the bidder/proposer and will not be disclosed by the bidder/proposer prior to opening in case of an advertised procurement, directly or indirectly to any other bidder/proposer or to any competitor.

H. No attempt has been made or will be made by the bidder/proposer to induce any other person or firm to submit or not submit a bid/proposal for the purpose of restricting competition.

1.06 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for thirty days from the bid closing date.

B. Acceptance of the bid/proposal of the successful bidder will become contractual obligations if procurement action ensues.

C. If this bid is accepted by Owner within the time period stated above, we will:
   1. Execute the Agreement within seven days of receipt of Notice of Award.
   2. Furnish the required bonds within seven days of receipt of Notice of Award.
   3. Commence work within seven days after written Notice to Proceed of this bid.

D. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Owner by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

E. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.07 CONTRACT TIME

A. If this Bid is accepted, we will:

B. Complete the Work by the _____ day of _____.

1.08 CHANGES TO THE WORK

A. When Architect establishes that the method of valuation for Changes in the Work will be net cost plus a percentage fee in accordance with General Conditions, our percentage fee will be:
   1. Fifteen (15) percent overhead and profit on the net cost of our own Work;
   2. Five (5) percent on the cost of work done by any Subcontractor.

B. On work deleted from the Contract, our credit to Owner shall be Architect-approved net cost plus fifty (50) of the overhead and profit percentage noted above.

1.09 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.
   1. Addendum # _____ Dated _____.
   2. Addendum # _____ Dated _____.
   3. Addendum # _____ Dated _____.
   4. Addendum # _____ Dated _____.

1.10 REPRESENTATIONS & CERTIFICATIONS

A. The Bidder, by the execution of this Bid From, makes the following representations and certifications as part of this Bid on the project identified in the Bid Form.
   1. 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 if my bid is accepted and I am awarded the contract.
   2. AVAILABILITY: The number and amount of other contracts and awards pending which i am or will become obligated to perform, now and or during the course of my work on this project, will not interfere with or hinder the timely prosecution of my work.
   3. INDEPENDENT PRICE DETERMINATION: The Contract Sum in this bid has been arrived at independently, without consultation, communication, or agreement for the purpose of restricting competition.
   4. ACCURACY: I have checked all the figures contained in this proposal and further understand that the Owner will not be responsible for any errors or omissions made therein by the undersigned.
   5. CONTRACT: I will assist and cooperate with the Owner in preparing the formal Contract, and shall execute same and return to the Owner along with surety, bonds, and insurance certificates as may be required by the specifications and other Contract Documents, within ten (10) days following its receipt.
   6. OWNER ACCEPTANCE: It is understood that the right is reserved by the Owner to reject any or all proposals, to waive all informalities in connection therewith, and to award a contract for any part of the Work or the Project as a while. It is agreed that this proposal may not be withdrawn for a period of thirty (30) days after it has been opened, without permission of the Owner.
   7. AUTHORIZASITON: 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 conditions and provisions thereof.

1.11 BID FORM SUPPLEMENTS

A. The following information is included with Bid submission:

1. Alternates: _____, _____, _____.

1.12 BID FORM SIGNATURE(S)

A. The Corporate Seal of

B. _____

C. (Bidder - print the full name of your firm)

D. was hereunto affixed in the presence of:

E. _____

F. (Authorized signing officer, Title)

G. (Seal)

H. _____

I. (Authorized signing officer, Title)

1.13 IF THE BID IS A JOINT VENTURE OR PARTNERSHIP, ADD ADDITIONAL FORMS OF EXECUTION FOR EACH MEMBER OF THE JOINT VENTURE IN THE APPROPRIATE FORM OR FORMS AS ABOVE.

END OF SECTION

SECTION 00 4101
BID LISTING FORM
(*Must be completed & submitted with all Bid)

1.01 DETENTION EQUIPMENT CONTRACTOR (DEC)

A. Section 08 3463
Detention Doors & Frames _____ (List the name of one (1) approved manufacturer)

B. Section 08 7163
Detention Door Hardware _____ (List the name of one (1) approved manufacturer)

C. Section 88 8853
Security Glazing _____ (List the name of one (1) approved manufacturer)

D. Section 11 1900
Detention Equipment Contractor (DEC) _____ (List the name of one (1) approved DEC)

F. Section 12 5500
Detention Furniture & Accessories _____ (List the name of one (1) approved manufacturer)

G. Section 28 0500
Security Electronics, Common Work Results _____ (List the name of one (1) approved SEC)

NOTE: Bidder shall list only (1) approved manufacturer and (1) approved DEC per section. Listing of more than (1) manufacturer or DEC per section will result in disqualification of their bid.

SECTION 00 4323

ALTERNATES FORM

PARTICULARS

1.01 THE FOLLOWING IS THE LIST OF ALTERNATES REFERENCED IN THE BID SUBMITTED BY:

1.02 (BIDDER) _____

1.03 TO (OWNER): CHAMPAIGN COUNTY

1.04 DATED _____ AND WHICH IS AN INTEGRAL PART OF THE BID FORM.

ALTERNATES LIST

2.01 THE FOLLOWING AMOUNTS SHALL BE ADDED TO OR DEDUCTED FROM THE BID AMOUNT. REFER TO SECTION 01 2300 - ALTERNATES.

ALTERNATE # 1: ADD / (DEDUCT) $ _____

ALTERNATE # 2: ADD / (DEDUCT) $ _____

ALTERNATE # 3: ADD / (DEDUCT) $ _____

ALTERNATE # 4: ADD / (DEDUCT) $ _____

END OF SECTION

SECTION 00 5000

CONTRACTING FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.01 CONTRACTOR IS RESPONSIBLE FOR OBTAINING A VALID LICENSE TO USE ALL COPYRIGHTED DOCUMENTS SPECIFIED BUT NOT INCLUDED IN THE PROJECT MANUAL.

1.02 AGREEMENT AND CONDITIONS OF THE CONTRACT

A. See Section 00 5200 - Agreement Form for the Agreement form to be executed.

B. See Section 00 7200 - General Conditions for the General Conditions.

C. See Section 00 7300 - Supplementary Conditions for the Supplementary Conditions.

D. The Agreement is based on AIA A101.

E. The General Conditions are based on AIA A201. Copies of this document are available from the Office of the Architect at no charge.

1.03 FORMS

A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in Contract Documents.

B. Bond Forms:
   1. Bid Bond Form: AIA A310.
   2. Performance and Payment Bond Form: AIA A312.

C. Post-Award Certificates and Other Forms:
   1. Schedule of Values Form: AIA G703.
   2. Application for Payment Forms: AIA G702 with AIA G703 (for Contractors).

D. Clarification and Modification Forms:
   1. Substitution Request Form: CSI/CSC Form 1.5C (During the Bidding/Negotiating Stage).
   2. Substitution Request Form: CSI/CSC Form 13.1A (After the Bidding/Negotiating Stage).
   3. Architect's Supplemental Instructions Form: AIA G710.
   4. Construction Change Directive Form: AIA G714.
   5. Proposal Request Form: AIA G709.
   6. Change Order Form: AIA G701.

E. Closeout Forms:
   1. Certificate of Substantial Completion Form: AIA G704.
   2. Consent of Surety to Final Payment Form: AIA G707.

1.04 REFERENCE STANDARDS

A. AIA A101 - Standard Form of Agreement Between Owner and Contractor where the basis of Payment is a Stipulated Sum; 2017.

B. AIA A201 - General Conditions of the Contract for Construction; 2017.

C. AIA A310 - Bid Bond; 2010.

D. AIA A312 - Performance Bond and Payment Bond; 2010.

E. AIA G701 - Change Order; 2017.

F. AIA G702 - Application and Certificate for Payment; 1992.

G. AIA G703 - Continuation Sheet; 1992.

H. AIA G704 - Certificate of Substantial Completion; 2017.

I. AIA G707 - Consent of Surety to Final Payment; 1994.

J. AIA G709 - Work Changes Proposal Request; 2001.

K. AIA G710 - Architect's Supplemental Instructions; 2017.

L. AIA G714 - Construction Change Directive; 2017.

M. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage); Current Edition.

N. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase); Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 5200

AGREEMENT FORM

PART 1 GENERAL

1.01 FORM OF AGREEMENT

1.02 THE AGREEMENT TO BE EXECUTED IS ATTACHED FOLLOWING THIS PAGE.

1.03 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions.

B. Section 00 7300 - Supplementary Conditions.

C. Section 01 4216 - Definitions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 7200

GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

1.01 THE GENERAL CONDITIONS APPLICABLE TO THIS CONTRACT IS AVAILABLE BY THE ARCHTIECT UPON REQUEST.

RELATED REQUIREMENTS

2.01 SECTION 00 7300 - SUPPLEMENTARY CONDITIONS.

2.02 SECTION 01 4216 - DEFINITIONS.

SUPPLEMENTARY CONDITIONS

3.01 REFER TO DOCUMENT 00 7300 - SUPPLEMENTARY CONDITIONS FOR AMENDMENTS TO THESE GENERAL CONDITIONS.

END OF SECTION

SECTION 00 7300

SUPPLEMENTARY CONDITIONS

PART 1 GENERAL

1.01 SUMMARY

A. These Supplementary Conditions amend and supplement the General Conditions defined in Document 00 7200 - General Conditions and other provisions of Contract Documents as indicated below. Provisions that are not so amended or supplemented remain in full force and effect.

B. The terms used in these Supplementary Conditions that are defined in the General Conditions have the meanings assigned to them in the General Conditions.

1.02 RELATED SECTIONS

A. Section 00 5000 - Contracting Forms and Supplements.

B. Section 01 4216 - Definitions.

1.03 MODIFICATIONS TO GENERAL CONDITIONS - FOR AIA DOCUMENT A201

A. AIA DOCUMENTS

1. The specifications contained in the Contract Manual and the accompanying drawings shall be subject to all of the requirements of the following document issued by the American Institute of Architects (AIA), Washington, D.C.; AIA Document A201, General Conditions of the Contract for Construction, current edition. These General Conditions apply to all Contractors and Subcontractors involved in this project.

B. PAYMENT AND PERFORMANCE BONDS

1. Contractor shall provide separate payment and performance bonds on AIA forms and issued by a surety, or sureties, acceptable to the Owner. Each of the bonds shall include a penal sum in the amount of one hundred percent (100%) of the Contract Sum. Contractor's surety(ies) shall be deemed to have waived notice of, and to have consented to, changes to the Contract Documents including the time for performing the Work and payment compensation to Contractor hereunder and the Work to be performed. The Contract Documents shall be incorporated by reference in each of the bonds.

C. INSURANCE

1. The contractor shall not commence work under the Contract until he has obtained all insurance required as stated herein.

D. CERTIFICATES OF INSURANCE

1. Within five (5) business days after the date of the Award of Contract, each Contractor shall file; in the name of the Owner, C/O Reifsteck Reid & Company Architects, 909 Arrow Road, Champaign, IL 61821. Certificates of Insurance, showing complete coverage of all insurance required, signed by the insurance companies or their authorized agents.

E. COMPENSATION

1. Principal Contractor shall carry sufficient insurance on his workmen to absolutely protect the Owner from any liability or damage resulting to the workmen as provided under the "Workmen's Compensation Act", "Scaffolding Act" and "Structural Works Act".
2. The Principal Contractor and all Subcontractors performing services on said site shall take out and furnish to the Owner, and maintain during the life of this Contract, complete Insurance coverage in the amounts as specified herein. The Owner, the Architect and their Consultants shall be named as additional insured's (on a primary and non-contributory basis, including completed operations) on these policies.
3. Such insurance shall not be less then:
   a. Workmen's Compensation and Occupational Diseases including Employee's Liability Statutory Limits:
      1) $100,000 each accident
      2) $500,000 Disease Policy Limit
      3) $100,000 Disease -each employee

b. Broad Form Comprehensive or Commercial General Liability Insurance, including Contractor's Protective, Personal Injury, Completed Operations, Worker's Comp., Contractual and X.C.U. Coverage where hazard exists.

1) Comprehensive General Liability

(a)	Bodily Injury	$1,000,000/$1,000,000
(b)	Property Damage	$1,000,000/$1,000,000 (or combined single unit of $1,000,000)

2) or Commercial General Liability

(a)	General Aggregate	$1,000,000
(b)	Product Completed Operations	$1,000,000
(c)	Personal & Advertising Injury	$1,000,000
(d)	Each Occurrence	$1,000,000
(e)	Fire Damage	$ 50,000
(f)	Medical Expense	$ 5,000

c. Comprehensive Automobile Liability Insurance (Includes non-owned, hired and rented vehicles, as well as owner vehicles):

1)	Bodily Injury	$1,000,000/$1,000,000
2)	Property Damage	$1,000,000/$1,000,000 each occurrence (or combined single unit of $1,000,000)

d. Excess or Umbrella Liability of $1,000,000 each occurrence and aggregated is acceptable to meet above limits.

4. The above Comprehensive General Liability Insurance shall be specifically endorsed to cover the terms of the Indemnification agreement set forth hereinafter.
5. Article 11.3.1 of the General Conditions should be amended to include a $1,000 deductible with the Contractor responsible for the deductible amounts indicated in Paragraph 11.3.1.
6. Contractor shall require its subcontractors to carry their own insurance in the amounts stated above. Contractor shall keep on file current and renewal certificates of insurance showing adequate coverage during the construction period.
7. This insurance shall cover all Contracts and any extra work connected with the construction of this Project.
8. Contractors shall instruct their insurance companies to supply Reifsteck Reid & Company Architects with Certificate of Insurance, in duplicate, showing that such insurance is kept in force until completion of the Contract.

F. INDEMNIFICATION AGREEMENT

1. During the performance of the Contract, the Contractor shall indemnify and save harmless the Owner, the Owner's agents, servants and employees, against all loss, damage or expense which they may sustain or become liable for on account of damage to or destruction of property, resulting from the performance of work under the contract by the Contractor, or his subcontracts, or any employees of any of them or due to the condition of the premises or other property of the Owner, upon, about, or in connection with, which any work incidental to the performance of the Contract is carried on.

G. BUILDER'S RISK INSURANCE

1. The Owner's Risk: The Owner will provide a builder's risk insurance policy which shall insure against all risks of direct physical loss or damage to the completed work, subject to the exclusion contained in the policy. The policy shall be issued under a Completed Value form with 100% of the insurable value of the work to be done and incorporated in the building under this contract and upon all materials in or adjacent thereto and intended for use thereon. The policy shall be subject to a $1,000,000 deductible and shall be issued for the benefit of the Owner, Contractor or Subcontractor, as their interest may appear. This policy excludes theft.
2. The Contractor's Risk: The Contractor is responsible for and shall carry whatever additional insurance he may deem necessary to protect himself against hazards or perils not covered by the Owner's builder's risk insurance. The Contractor shall also be responsible for the amount of the Owner's builder's risk deductible. Any loss or cost of repair not covered by such insurance shall be borne by the Contractor without additional

cost to the Owner. The insurance maintained by the Owner does not cover any tools owned by mechanics or any tools, equipment, scaffoldings, stagings, towers and forms owned or rented by the Contractor, the capital value of which is not included in the cost of the work.

H. EMPLOYEES
   1. The Contractors will at all times enforce strict discipline and good order amount their employees and shall not employ any unfit person or anyone not skilled in the task assigned him. The Owner shall have the right to require the removal from the project any employee of the Contractor or his Subcontractors if in their judgment such removal shall be necessary to protect the interest of the Owner.

I. PERFORMANCE OF WORK
   1. Bidders shall agree to perform this work in compliance with all Federal, State, and Local laws, ordinances, statues, rules and regulations governing or affecting the accomplishment of this work.

J. SCHEDULE COMPLIANCE
   1. Contractor's Responsibility for Promptness of Execution
      a. It is not incumbent upon the Architect or Owner to notify the Contractor when to begin, to cease or resume work, not to give early notice of the rejection of faulty work, nor in anyway to superintend so as to relieve the Contractor or responsibility or of any consequence of neglect or carelessness by him or his subordinates. All materials and labor shall be furnished at such time as shall be for the best interest of all Contractors concerned, to the end that the combined work of all may be properly and fully completed in accordance with the approved schedule.
      b. The Contractor shall complete the several portions of the whole of the Work at or before the time or times established by the approved schedule.
      c. Any employee of the Contractor or his Subcontractors whom the Construction Manager or Owner considers detrimental to the proper carrying out of the work is to be removed promptly on the request of the Construction Manager and/or Owner.
   2. Owner's Right to Terminate Contract Agreement and Complete the Work
      a. In the event of any default by the Contractor, the Owner, shall have the right to terminate the Contract Agreement after giving the Contractor seven (7) calendar days' written notice of such termination. The Owner may then take possession of the Work, including all materials, tools and equipment and may complete the Work by whatever method and means he may select. It shall be considered a default by the Contractor whenever he shall:
         1) Be adjudicated bankrupt, make an assignment for the benefit of his creditors, have a receiver appointment for his assets, have a petition in reorganization approved under Chapter X or XI of the Acts of Congress relating to bankruptcy, or otherwise evidence his insolvency. In addition thereto, it shall be considered a default under this Section if the Contractor has an unresolved involuntary petition in bankruptcy or for reorganization under Chapter X or XI of the Acts of Congress relating to bankruptcy o ran unresolved application for a receiver of unresolved issues shall be deemed to be defaults, the Contractor must have failed to have such questions resolved within seven (7) calendar days after the Construction Manager has given written notice that such unresolved petitions or applications shall be considered a default.
         2) Disregard or failure to comply with substantial provisions of the Contract Documents or the Construction Manager's instructions, failure to execute the Work according to the agreed schedule or completion, including extensions thereof, or upon seven (7) calendar days' written notice from the Construction Manager, failure to show that he is making such progress as will insure completion of the Work in accordance with such schedule of completion, including extension thereof.
         3) Failure to provide a qualified supervisor, competent workmen or subcontractor or proper materials, or fail to make prompt payment thereof. If the unpaid balance

of the Contract Sum exceeds the costs of finishing the Work, including compensation for the Architects and/or the Construction Manager's additional services made necessary thereby, such excess shall be paid to the Contractor. If the unpaid balance of the Contract Sum is less than the cost of finishing the work including compensation for the Architects's and Owner's additional services made necessary thereby, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or to the Owner, as the case may be, shall be certified by the Construction Manager upon application and his obligation for payment shall survive the termination of the Contract.

K. EXAMINATION OF PREMISES
   1. Before submitting proposals for this work, each bidder will be held to have examined the Site and satisfied himself as to the conditions existing and under which he will be obliged to operate, or that will in any manner, affect the work of this Contract. No allowance will be made subsequently in this connection on behalf of the Contractor for any error or negligence on his part. The Contractor agrees to accept the existing conditions as found at the time of signing Contracts.

L. SPECIFICATIONS AND DRAWINGS
   1. Titles to divisions and paragraphs in these specifications are introduced merely for convenience and shall not be taken as a correct or complete segregation of the several units or material and labor.
   2. Where details are given, they must be accurately followed. In all instances, figured dimensions must be used in preference to scaling the drawings.
   3. The drawings and these specifications are intended to be cooperative and anything shown in one and not in the other shall be furnished and constructed as carefully as if plainly shown on both.
   4. The Contractor shall take no advantage of any manifest omission or discrepancy which may exit between the Drawings and Specifications, but all such omissions or errors shall be reported to the Architect for interpretations or correction as soon as discovered. If anything in either drawings or specifications is not clear to the Contractor, he must first, before submitting a bid or signing a Contract, inquire of the Architect the exact meaning and intention as no extras will be allowed the Contractors for any misconstruction or misunderstanding of the drawings and specifications.
   5. Any details of construction or items of material necessary of the completion of the work in a substantial workman-like manner, shall be furnished and installed according to best construction practices whether specifically mentioned or not.
   6. The Contractors and Subcontractors shall plan their work so that all details of construction shall be taken care of in a proper workmanlike manner, and so as not to interfere with work of other trades as the job progresses.

M. DETAILS AND LARGE SCALE DRAWINGS
   1. Additional detail drawings will be furnished to the Contractors, as required. These will be true and reasonable developments of work called for, or required, for substantial workmanlike construction according to best practices.

N. MATERIAL AND WORKMANSHIP
   1. The Contractor will purchase all materials and supplies outright and not subject to any conditional sales agreement, bailment lease or other agreement reserving unto the seller any right, title or interest therein; except for legal lien rights.
   2. All materials shall be new and the best of their respective kinds and grades, and all workmanship shall be done by competent mechanics in a neat and workman-like manner according to the best practices. If required, the Contractor shall submit samples of materials he intends to use for approval. The samples shall remain the property of Reifsteck Reid & Company Architects until after expiration of the guarantee.
   3. The Owner or his agent shall have full power to reject any materials or workmanship which, in their opinion, does not conform with these specifications or drawings, and cause same to be immediately removed and reconstructed without additional cost to the Owner.

O. ADDENDA & INTERPRETATIONS
   1. There shall be no substitutions or changes from the materials and methods described herein or shown on the drawings without written addenda from the Architect.
   2. All requests for interpretations, modifications, substitutions or changes in the drawings and specifications shall be directed to Reifsteck Reid & Company Architects.

P. MEASUREMENTS
   1. Before ordering any materials or doing any work, each Contractor shall verify all measurements at the site and shall be responsible for the correctness of same. No extra charge or compensation shall be allowed on account of the difference between actual measurements and the dimensions indicated on the drawings. Any difference or errors which may be found shall be reported to the Architect for interpretation before proceeding with work.

Q. PATCHING OF DAMAGE
   1. The expense of any undue alterations, cutting, patching or repairing of damage due to carelessness or neglect caused by any trade shall be borne by the damaging contractor. Repair of such damage shall be done by the workmen of the Contract whose work was damaged so that such patching will be least conspicuous.

R. OTHER WORK NOT IN CONTRACT
   1. The Owner reserves the right to let separate Contracts for other work in connection with this project, but agrees that such work shall not interfere with the work of the Contracts previously made.

S. PERMITS
   1. The Owner will obtain and pay for the Building Permit. All other permits will be paid for by the appropriate contractor.
   2. The Contractor shall obtain all permits necessary for construction of the project.

T. CLEANING OF GROUND & BUILDINGS
   1. At the completion of the project and before final acceptance by the Owner, the area shall be cleared of all rubbish, building materials and debris which accumulate during the process of work under this Contract. The construction area shall be left broom clean. All spills and splatters shall be removed from finished surfaces. Each contractor will be responsible for all cleaning associated with their work.

U. LIENS
   1. Before final payment, the Contractors shall submit receipted invoices and cancelled checks, or lien waiver from all subcontractors and material suppliers covering all labor and materials furnished on the job.
   2. If any liens or unpaid bills should be presented to Reifsteck Reid & Company Architects or the Owner after full payment has been made to the Contractor, the contractor or his bondsmen shall refund to the Owner all money the latter may be compelled to pay in discharging such obligations, including all court costs and reasonable attorney's fees.

V. WAIVERS OF LIEN
   1. The Contractor shall provide the Owner with releases and waivers of lien form each of his subcontractors and material suppliers on a standard form. Submit waivers (partial waivers when applicable) monthly. Final waivers shall be so designated. These waivers of lien shall be submitted to the Architect before payment is made to the contractor for the request for payment involving said work.
   2. A waiver of lien shall be submitted form any and all persons furnishing labor or materials, or both, before each payment can be made. All waivers of lien shall be notarized. Waivers of lien shall be furnished for all work requested in the current application for payment. Final waivers of lien must be presented before final payment.

W. PAYMENTS WITHHELD
   1. The Architect or Owner may withhold, or on account of subsequently discovered evidence, nullify the whole part of any pay request to such an extent as may be necessary to protect the Owner from loss on account of:

a. Defective work not remedied.
b. Claims filed or reasonable evidence indicating probably filing of claims.
c. Failure of the contractor to make payments properly to subcontractors for materials and/or labor.
d. Damage to the existing building.
e. When the above grounds are removed, payment will be made from the amounts withheld because of them.
f. Should the Contractor fail to construct any work according to the drawings and specifications, or should he refuse to correct any work not done according to the drawings and specifications, the Owner may, after having given the Contractor ten days written notice, construct such work or make repairs necessary to meet the requirements of the Contract. The cost of such work will be deducted from final payment due the Contractors.

X. SUBCONTRACTORS
1. The Contractor shall be responsible for any and all subcontractors working under them, and shall carry insurance for them or see that they care carrying it themselves so as to relieve the Owner of any and all liability.
2. Nothing contained in the Contract Documents shall create any contractual relation between any subcontractor and the Owner.
3. The Owner or Reifsteck Reid & Company Architect assumes no responsibility for the overlapping or omission of parts of the work by various subcontractors in their contract with the Principal Contractor.
4. All subcontractors shall comply with the requirements of the General Contract.

Y. EXTRAS & CHANGES
1. Should any extra work or changes be required during construction, the Owner, Contractor and the Architect, shall agree upon the price for such extra work or changes and the Architect shall issue a change order to the Contractor for such work as agreed upon. Payment shall be made under same conditions as for original Contract. No payment shall be made for extra work or materials unless a formal written change order is issued by Reifsteck Reid & Company Architects.

Z. CORRECTION OF WORK AFTER FINAL PAYMENT
1. Neither the final certificate, nor payment, nor any provision in the Contract Documents, shall relieve the Contractor of responsibility for faulty materials or workmanship discovered to be not as specified or shown on the drawings.
2. The Contractor shall remedy and defects due thereto, and pay for, any damages to other work resulting there from, which shall appear within a period of one year from the date of acceptance, or for such longer period imposed by Illinois law.
3. The Owner shall give notice of observed defects with reasonable promptness. The Architect shall judge the defects as to maintenance, workmanship or material defects.
4. All questions arising under the article shall be decided by Reifsteck Reid & Company Architects, subject to the legal dispute resolution chosen in the contract. Arbitration shall not be used.

AA. RETAINED PRCENTAGE
1. The retained percentages will be ten percent (10%) of the cost of the work until Final Payment. The retained percentage may be reduced after the job is 90% complete at the Architects' direction with approval from the Owner.

AB. OCCUPANCY BEFORE COMPLETION
1. The Owner will occupy the project site throughout the duration of the project. It is agreed that such occupancy of the project site will not constitute acceptance of workmanship or materials used in the construction of the project and that such occupancy will not relieve the Contractor from his obligation to complete any part of the project in compliance with the Contract. The Owner agrees to permit the Contractor to fulfill the requirements of the Contract in accordance with the instructions issued to the Contractor by the Architect upon occupancy by the Owner.

1.04 MODIFICATIONS TO AIA DOCUMENT A105

A. GENERAL STATEMENT: The following supplements modify, change, delete from or add to the AIA Document A105. Where any article of the General Conditions is modified or any paragraph, subparagraph or claus thereof is modified or deleted by these supplements, the unaltered provisions of the article, paragraph, subparagraph or clause shall remain in effect.

B. ARTICLE 5 - INSURANCE AND BONDS
   1. 5.1 Contractor's Liability Insurance - Add the following clause to 5.1.1 Liability insurance shall include all major divisions of coverage and be on a comprehensive basis including:
      a. Premises Operation (including X-C/U as applicable) and products and completed operations.
      b. Independent Contractor's Protective.
      c. Personal Injury Liability with Employment Exclusion.
      d. Owned, non-owned and hired motor vehicles.
      e. Board from Property Damage.
      f. Umbrella Excess Liability.
      g. Project Owner and Architect/Engineer named as Additional Insured.
      h. Contractors' policies will be primary and noncontributory.
   2. 5.1.2 Add the following clause to 5.1.2 The insurance required by subparagraph 5.1.1 shall be written for not less than the following, or greater if required by law:
      a. Worker's Compensation:
         1) State: Statutory
         2) Applicable Federal Statutory
         3) Employer's Liability: Bodily Injury by Accident $500,000 each Accident
         4) Bodily Injury by Disease $500,000 Policy Limit
         5) Bodily Injury by Disease $500,000 Each Employee
      b. Commercial General Liability:
         1) General Aggregate $2,000,000
         2) Product/Completed Operations Aggregate $2,000,000
         3) Personal & Advertising Injury $1,000,000
         4) Each Occurrence $1,000,000
         5) Designated Construction Project General Aggregate Limit C6 25 03
      c. Comprehensive Automobile Liability: Liability $1,000,000
      d. Umbrella: Liability $3,000,000
   3. 5.1.3 - Add the following clause 5.1.3.1 The Contractor shall furnish one copy of each of Certificates of Insurance herein required for each copy of agreement which shall be specifically set forth evidence of all coverage required by subparagraphs 5.1.1, 5.1.2, and 5.1.3. The form of the Certificate shall be Acord From 25-S or insurer's standard form. The Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending coverage of limits.
   4. 5.6 PERFORMANCE BOND AND PAYMENT BOND - Add the following subparagraph 5.6: The Owner will require a Performance Bond and a Payment Bond. Refer to Section 00 2113 - Instructions to Bidders for specific instruction regarding Performance Bond and Labor and Material Payment Bond.

C. ARTICLE 8 -CONTRACTOR
   1. 8.6 TAXES - Delete subparagraph 8.6 in its entirety and substitute the following: "8.6 The Owner is exempt from states tax on products permanently incorporated in work."
   2. 8.7 PERMITS, FEES AND NOTIECES - Add the following sentence to this subparagraph: "The Owner shall be responsible for securing and paying for the building permit."
   3. 8.9 USE OF SITE - Add the following subparagraph: 8.9.1 "Refer to Section 01 1000 Summary for further provision on this subject."

D. ARTICLE 12 - PAYMENTS
   1. 12.2 APPLICATIONS FOR PAYMENT - Add the following clauses 12.2.3 and 12.2.4 to subparagraph 12.3.1:

a. 12.2.3 - Until final payment, the Owner will pay 90 percent of the amount due the Contractors on account of progress payments. If the manner of completion of the Work and its progress are and remain satisfactory to the Architect/Engineer, and in the absence of other good and sufficient reasons, for each Work category shown to be 50 percent (50%) or more complete in the Application for Payment, the Architect/Engineer will, without reduction certify any remaining progress payments for each Work category to be paid in full.
b. 12.2.1 - The full contract retainage may be instated if the manner of the completions of work and its progress do not remain satisfactory to the Architect/Engineer, or if the Surety withholds its consent, or for other good and sufficient reasons.
c. 12.2.1 - Add the following to subparagraph 12.2.1.1: Contractor shall submit to Owner through the Architect/Engineer with each payment request, waivers of lien from each subcontractor.

1.05 BUILDERS RISK INSURANCE

A. Contractor's responsibility: The Contractor shall provide a builder's risk insurance policy which shall insure against all risks of direct physical loss or damage to the completed work, subject to the exclusion contained in the policy. The policy shall be issued under a Completed Value form with 100% of the insurable value of the work to be done and incorporated in the building under this contract and upon all materials in or adjacent thereto and intended for use thereon. The policy shall be subject to a $1,000,000 deductible and shall be issued for the benefit of the Owner, Contractor or Subcontractor, as their interest may appear. Any loss or cost of repair not covered by such insurance shall be borne by the Contractor without additional cost to the Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 8250
PREVAILING WAGE ACT

1.01 SECTION INCLUDES:

A. This contract calls for the construction of a "public work" within the meaning of the Illinois Prevailing Wage Act, 920 ILCS 130/.01. The Act requires contractors and subcontractors to pay all laborers, workers and mechanics performing services on public works projects no less than the "prevailing rage of wages" (hourly cash wages plus fringe benefits) in the county where the work is performed. Each Contractor and Subcontractor rendering services under this contract must comply with all requirements of this Act. Each Contractor and Subcontractor shall keep records of the prevailing wages paid to their employees, submit a monthly certified payroll to Owner, and make such records available to Owner for inspection upon seven (7) business days' notice.

B. For information regarding the current prevailing wage rates for each county in Illinois can be found at: https://www2.illinois.gov/idol/laws-rules/conmed/pages/rates.aspx.

C. Prevailing Wage Rates change periodically. Contractor shall verify and revise the prevailing wages on a regular basis.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 1000

SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Champaign County Jail Consolidation

B. Owner's Name: Champaign County.

C. Architect's Name: Reifsteck Reid & Company Architects.

D. The Project consists of the construction of an addition to the Champaign County Jail.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price

1.03 DESCRIPTION OF WORK

A. Project Description: The project work shall include an addition to and selective renovation of the Champaign County Jail. The scope of work in general includes an approximately 27,000 SF addition, including two new security pods containing a control post, cells, dayrooms, and multipurpose rooms; office spaces; a medical wing including exam rooms, pharmacy, and nurse station; and supporting spaces such as storage, mechanical, electrical, and IT spaces. Work shall include all necessary labor, supervision, materials, supplies, transportation, equipment, and services necessary and as required to perform the work set forth in the Contract Documents. Work shall include at minimum, but not necessarily be limited to, the following:

1. Temporary facilities, including construction fencing, utilities, and construction entrance.
2. Site clearing and grubbing as required for new work.
3. Site excavation work, including building pad and footings; building layout and staking; site dewatering and erosion control; backfilling.
4. Site development work, including site utility work, earthwork, grading, site paving, and landscaping.
5. Selective demolition and renovation of existing exterior and interior walls, finishes, doors, windows, etc.
6. Concrete footings/foundations, slab-on-grade.
7. Masonry work including CMU and brick veneer, including grout, ties and reinforcing, and other accessories.
8. Structural steel and loadbearing framing, including columns, beams, joists, etc.
9. Metal fabrications, including delegated design metal stairs, etc.
10. Thermal insulation, flashings, and weather barriers.
11. PVC membrane roofing, flashings, and accessories, with continuous rigid insulation and cover board, and roof patching and tie-in work to the existing construction.
12. Interior roof drains and storm piping.
13. Exterior insulated and interior hollow metal doors and frames with hardware.
14. Exterior insulated windows and glazing, and interior security glazing.
15. Thermally insulated skylights.
16. Interior finishes including abuse resistant gypsum board ceilings, suspended acoustical ceiling tile and grid, epoxy flooring, and painting.
17. Restroom fixtures and accessories.
18. Casework and countertops.
19. Detention equipment, including doors, frames, and hardware, security glazing, furniture, security mesh and screens, etc.
20. Electronic security integration.
21. Fire protection, Plumbing, HVAC (including geothermal), Electrical, and Technology work associated with the addition and renovation.

B. Alternate Bid Work:

1. See Section 01 2300 - Alternates for further description.

C. The General Contractor will be the Coordinating Contractor, and shall bear the responsibility of obtaining and coordinating all trades and subcontractors required to perform the work as specified in the Contract Documents.

D. All electrical work shall be performed by a licensed electrician.

E. All plumbing work shall be performed by a licensed plumber.

F. A pre-bid meeting has been scheduled for all Contractors interested in submitting bids for the project work. See Section 00 2113.
   1. Contractors are encouraged to attend the pre-bid meeting. A walk through of the project work site will commence immediately following the meeting.

G. General Contractor will be solely responsible for protection of existing building from weather, maintaining a weathertight, insulated enclosure at the project area as well as all surrounding areas adjacent to the project area that may be affected by the Work, during all demolition and construction activities throughout the course of the project.

H. Existing construction and finishes within the spaces below the project work areas must be completely protected during all required work (including work to the floor/ceiling system between floors, etc.). All damage must be corrected or replaced by Contractors at direction of U of I Project Manager. Corridor finishes adjacent to work areas must be protected when used by Contractors for movement of construction materials into the project work areas or for relocations of furniture and equipment.

I. NOTE: Contractor attention is directed to the required work site and building protection required within the project documents. Damage to any site or building elements will require the Contractor to clean, repair, or replace the damaged item of system, at the sole discretion of the U of I Project Manager. Special Contractor attention is directed to Specifications 01 3500 - Special Procedures, 01 5000 - Temporary Facilities and Controls, 01 7000 - Execution and Closeout Requirements, 017600 - Protecting Installed Construction & Drawings.

J. All utility outages shall be submitted to the U of I Project Manager a minimum of five business days in advance of the desired outage. See Section 01 3500 - Special Procedures for outage procedures.

K. In the absence of any specific instruction or specification, employ workmanship and material approved by Architect with quality equal to that in contract documents.

L. Installation of material or equipment or performance of work, service, or labor requiring Architect prior approval without first securing approval is cause for rejection and correction of the work without additional compensation or extension of contract time.

1.04 INQUIRIES/ADDENDA

A. Direct questions to Alaina Davis, Contract Specialist, email: adavis3@illinois.edu. Carbon copy all inquiries to <Professional Services Consultant> - Reifsteck Reid Project Manager, email: cbieser@rr-arch.com.

B. Addenda may be issued during the bidding period. All Addenda become part of the Contract Documents. Include resultant costs in the Bid Amount.

C. Verbal answers are not binding on any party.

D. Clarifications requested by bidders must be in writing not less than 7 days before date set for receipt of bids. The reply will be in the form of an Addendum, a copy of which will be forwarded to known recipients and planholders.

1.05 COORDINATION

A. Each contractor shall examine contract documents covering work of ALL trades coming in contact with or superimposed on work of each trade. Become acquainted with **entire** project to achieve coordination, efficient, and timely performance of work. Provide all work and material of each trade necessary for receiving, executing, and completing work coming in contact with each trade. No extra charge or compensation is allowed on account of additional work resulting from lack of coordination.

B. Contractors will be required to coordinate use and any potential system shutdowns of building and/or site with other concurrent work by the respective projects' contractors.

C. Contractors shall coordinate with Owner for scheduling and sequencing delivery and installation of Owner supplied items such as furniture, cabinets, office equipment, and other furnishings.

1.06 EXISTING CONDITIONS

A. All asbestos bearing materials exposed are scheduled to be removed by an Abatement Contractor (whose work is described in both Drawings and sections within the Project Manual and is assigned to the General Contractor of this project) prior to the other contractor's work. Contractors may obtain electronic copies of the previous asbestos surveys from Architect upon request.

B. Staging for refuse chute, dumpster, supplies and equipment access under the Base Bid shall be as indicated on the Construction Documents. Contractors shall keep them clean at all times. Coordinate dumpster pick-up so traffic in parking areas and pedestrians are not disrupted.

C. Provide necessary safeguards to prevent injury or damage. Execute work without damage or injury to persons, existing improvements, lawns, adjoining structures, and other property.
   1. All existing corridors, doorways and sidewalks must be kept clear and safely passable during construction.
   2. Damage to existing paving, landscaping, lawn, artificial turf, and buildings shall be avoided and all damage shall be repaired by the Contractor should it occur.

D. Contractors shall be prepared to furnish the Architect with photographs of existing conditions prior to starting work.

E. Contractor shall verify all measurements at site before ordering material or doing work. No extra charge or compensation is allowed on account of differences between actual dimensions and measurements indicated on drawings. Submit any differences to Architect for clarification before proceeding.

1.07 WORK BY OWNER

A. Items noted NIC (Not in Contract) or "By Owner" will be supplied and installed by Owner either before or after Substantial Completion. Some items include:
   1. Furniture.
   2. Vinyl Wall Decal.

1.08 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.

B. Owner intends to occupy the Project upon Substantial Completion.

C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations. Work stoppage and personnel remobilization may be required. Contractor's ability to perform noisy operations may be restricted at times for events occuring elsewhere in the facility. Coordinate with Owner.

D. Schedule the Work to accommodate Owner occupancy.

E. Contractor to move all property in affected areas including furniture, shelves, chairs, desks, and other furniture as needed. Contractor to coordinate this with project schedule and with the Owner.

1.09 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.
   1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. Construction Operations: Work areas outside the building shall be confined to the limits of the construction site. The allotment of work areas within the site to other Contractors and Subcontractors shall be made by the General Contractor. The general scheme of operations, work area assignments, and use of the job site shall be subject to the approval of the Architect and the U of I Project Manager.

C. Building Access: Uncontrolled or unrestricted access shall not be permitted through either an existing building or new building site for materials, debris, or equipment. All access routes and methods shall be controlled by the Contractor so as to minimize the disruption of the Owner's operations and shall be subject to approval of the Architect and the U of I Project Manager. Use of existing elevators in the building is **PROHIBITED** during the entire construction project.

D. Doors, windows, lawn and landscaping, parking areas and sidewalks shall be properly protected to prevent damage thereto. Paved areas shall be protected from oil spills and abrasions if utilized for layout space, temporary parking, or any other construction related activity. Paving surface shall be restored upon completion of its temporary use to a surface level and finish matching adjacent unused portions of paved surfaces. All painted markings on paved surfaces restored after temporary use. Wood members (2 X12 framing members) or plywood sheathing panels shall be used to protect any turf area or landscaping bed where equipment is moved into position and temporarily positioned to facilitate construction operations.

E. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by Others.
   3. Use of site and premises by the public.

F. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

G. Existing building spaces, other than what is indicated on the Drawings or in the Project Manual, may not be used for storage, unless written permission is granted by the U of I Project Manager.

H. Site Security: Full-time watchmen shall not be specifically required, but the Contractor shall provide inspection of site daily while the work is in progress and shall take whatever measures are necessary to secure the building from theft, vandalism and unauthorized entry.

I. Time Restrictions:
   1. Contractors shall limit especially noisy work during the hours of 12:00 pm to 1:30 pm whenever possible while the preschool/daycare is in session (8/22/22 - 12/16/22, and 1/17/23 - 5/12/23). This is the daily nap time for the children in attendance.

J. Utility Outages and Shutdown: Coordinate all outage requests with User and UI Project Manager. See Section 01 3500 - Special Procedures for outage request requirements.
   1. Limit disruption of utility services to hours the building is unoccupied.
   2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
   3. Prevent accidental disruption of utility services to other facilities.

1.10 TEMPORARY CONSTRUCTION FACILITIES

A. See Section 01 5000 - Temporary Facilities and Controls & 01 5100 - Temporary Utilities.

B. The following temporary utilities and facilities on the construction site shall be provided by the party indicated below:
   1. Telephone - Contractor provide Superintendent cell phone.
   2. Electricity - User will provide electrical power consisting of convenience outlets only. Contractor to provide for any additional electrical service or generators for equipment and procedures.
   3. Steam - N/A.
   4. Water - User provide existing system; Contractor provide hoses equipped with nozzles.
   5. Toilets - Contractor provide portable toilets. Locate inside designated construction area and secured from public access.
   6. Parking spaces for identified contractor's vehicles - See Section 01 5000 - Temporary Facilities and Controls.
   7. Parking spaces for workmen - See Section 01 5000 - Temporary Facilities and Controls.

8. Dumpster Location - As shown on Drawings.
9. Storage areas and facilities - As shown on Drawings.
10. Temporary Heat - Contractor shall provide as required.
11. Outages - Each contractor to coordinate utility outages with General Contractor and with Facilities Service Office and the Fire Department for fire alarm outages. See Section 01 3500 - Special Procedures.

C. Where permanent facilities constructed under the Contract are to be utilized to provide temporary heat or other services, the General Contractor shall be responsible for the cost of consumables, conversion and repair costs, guarantee and warranty adjustments with Subcontractors required to assure the performance of the guarantee requirements of the contracts, and cleaning costs.

1.11 WORK SEQUENCE

A. Coordinate construction schedule and operations with Owner.

1.12 SPECIFICATION SECTIONS APPLICABLE TO EVERY CONTRACT

A. Unless otherwise noted, provisions of the sections listed below apply to every contract. Specific items of work listed under individual contract descriptions constitute exceptions.
1. All Sections in Divisions 00 and 01.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2000

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Change procedures.

C. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 00 5000 - Contracting Forms and Supplements: Forms to be used.

B. Section 00 7200 - General Conditions and Document 00 7300 - Supplementary Conditions: Additional requirements for progress payments, final payment, changes in the Work.

C. Section 01 7800 - Closeout Submittals: Project record documents.

1.03 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.

F. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.

G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Percentage of Completion.
   9. Balance to Finish.
   10. Retainage.

E. Execute certification by signature of authorized officer.

F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

H. Submit one electronic and three hard-copies of each Application for Payment.

I. Include the following with the application:
   1. Transmittal letter as specified for submittals in Section 01 3000.
   2. Construction progress schedule, revised and current as specified in Section 01 3216.
   3. Partial release of liens from major subcontractors and vendors.
   4. Affidavits attesting to off-site stored products.

1.05 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

C. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

D. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

E. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

F. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

G. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 7000.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.

B. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
      b. Regulatory changes.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.
   6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Contractor's Substitution Request documentation must include the following:
      a. Project Information:
         1) Official project name and number, and any additional required identifiers established in Contract Documents.
         2) Owner's, Architect's, and Contractor's names.
      b. Substitution Request Information:
         1) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
         2) Description of Substitution.

3) Reason why the specified item cannot be provided.
4) Differences between proposed substitution and specified item.
5) Description of how proposed substitution affects other parts of work.

c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
1) Physical characteristics.
2) In-service performance.
3) Expected durability.
4) Visual effect.
5) Sustainable design features.
6) Warranties.
7) Other salient features and requirements.
8) Include, as appropriate or requested, the following types of documentation:
(a) Product Data: Including drawings and descriptions of products and fabrication and installation procedures.
(b) Samples where applicable or requested.
(c) Certificates, test, reports or similar qualification data. Material test reports shall be from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
(d) Coordination information, including a list of changes or modifications needed for parts of the Work and for construction performed by owner and separate contractors that will be necessary to accommodate proposed substitution.
(e) List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
(f) Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
(g) Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
(h) Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to product indicated results.
(i) Drawings, when required to show impact on adjacent construction elements.
9) Impact of Substitution:
(a) Savings to Owner for accepting substitution.
(b) Change to Contract Time due to accepting substitution. Include a detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include a letter from the manufacturer, on the manufacturer's letterhead, stating lack of availability or delays in delivery.

D. Limit each request to a single proposed substitution item.
1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

B. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
   1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
   2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
   3. Bear the costs engendered by proposed substitution of:
      a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

C. Substitutions will not be considered under one or more of the following circumstances:
   1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
   2. Without a separate written request.
   3. When acceptance will require revisions to Contract Documents.

3.03 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.

3.04 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record.

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preconstruction meeting.

B. Site mobilization meeting.

C. Progress meetings.

D. Construction progress schedule.

E. Submittals for review, information, and project closeout.

F. Number of copies of submittals.

G. Requests for Interpretation (RFI) procedures.

H. Submittal procedures.
   1. Verification of field dimensions
   2. Verify compliance with Contract Documents
   3. Certification review
   4. Transmit reviewed submittals to Architect/Engineer

1.02 RELATED REQUIREMENTS

A. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.

B. Section 01 6000 - Product Requirements: General product requirements.

C. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

D. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Schedule meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.
   4. Major Subcontractor.

C. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of list of subcontractors, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties to Contract and Architect.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   7. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 SITE MOBILIZATION MEETING

A. Project Coordinator will schedule meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:

1. Contractor.
2. Owner.
3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

C. Agenda:
1. Use of premises by Owner and Contractor.
2. Owner's requirements.
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Security and housekeeping procedures.
6. Schedules.
7. Application for payment procedures.
8. Procedures for testing.
9. Procedures for maintaining record documents.
10. Requirements for start-up of equipment.
11. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum bi-weekly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Maintenance of quality and work standards.
10. Effect of proposed changes on progress schedule and coordination.
11. Other business relating to work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 3216

3.05 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:
1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the

same space (interference); or when an item of work is described differently at more than one place in Contract Documents.

2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
      d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. Issue date, and requested reply date.
   3. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
   4. Annotations: Field dimensions and/or description of conditions which have engendered the request.
   5. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
   1. Indicate current status of every RFI. Update log promptly and on a regular basis.
   2. Note dates of when each request is made, and when a response is received.
   3. Highlight items requiring priority or expedited response.
   4. Highlight items for which a timely response has not been received to date.

H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.

I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.

1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.06 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.07 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.08 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.09 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
   1. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
   2. 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 of each of multiple items.
k. Drawing number and detail references, as appropriate.
l. Related physical samples submitted directly.
m. Indication of full or partial submittal.
n. Transmittal number, numbered consecutively.
o. Submittal and transmittal distribution record.
p. Other necessary identification.
q. Remarks.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

C. 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 indicated extent of revision.
3. Resubmit submittals until they are marked "Reviewed", "Furnish as Corrected", "No Exceptions Taken" or "Make Corrections Noted".

3.10 SUBMITTAL PROCEDURES

A. General Requirements:
1. Use a separate transmittal for each item.
2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section. 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. Transmit using approved form.
a. Use Contractor's form, subject to prior approval by Architect.
4. All submittals must have a letter of transmittal attached to the first page of the submittal, including electronic submittals. Letters of transmittal shall include:
a. Project Name.
b. Project Number.
c. Submittal Division Number, as referenced in the Project Manual.
d. Submittal Revision Number. Original Document labeled as "R0" with each revision consecutively number "R1", "R2", etc.
e. Description of what is included. For example: Product Data, Samples, Shop Drawings, Manufacturers Qualifications, Field Reports, Warranty, Manufacturer's Installation Instructions, etc.
5. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
6. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.

7. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
8. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
    a. Deliver submittals to Architect at business address for physical samples or hard copies and to submissions@rr-arch.com for electronic submittals.
9. Schedule submittals to expedite the Project, and coordinate submission of related items.
    a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
    b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
    c. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
10. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
11. Provide space for Contractor and Architect review stamps.
12. When revised for resubmission, identify all changes made since previous submission.
13. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
14. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
15. Submittals not requested will be recognized, and will be returned "Not Reviewed".
16. 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 on a submittal requiring coordination with other submittals until related submittals are received.

B. Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Submit concurrently with related shop drawing submittal.
4. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Do not reproduce Contract Documents to create shop drawings.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Contractor's responsibility for errors, omissions, or deviation from Contract Documents in submittals is **NOT** relieved by Architect/Engineer's review of submittals.

E. Allow enough 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.

F. Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

G. Use for Construction: Use only final submittals with marking indicating "Reviewed", "Furnish as Corrected" and initialed by Architect.

H. Samples Procedures:
1. Transmit related items together as single package.

2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.11 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will not acknowledge receipt, and take no other action.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

D. Except for Informational Submittals where no action and return of submittals is required, the architect will review each submittal, mark to indicate the action taken, and return.

E. Submittals for Review: The architect will electronically stamp each submittal with a uniform action stamp. The architect will mark the stamp appropriately to indicate the action taken as follows:
   1. Not requiring resubmittal:
      a. Reviewed: Indicates the submittals have been reviewed for general conformance with the design concept.
      b. Furnish as Corrected: Indicates contractor shall make corrections as noted on submittal.
   2. Requiring resubmittal:
      a. Incomplete: Resubmit: Indicates that an item(s) are missing from the submittal which was required by specifications. The entire submittal must be resubmitted.
      b. Revise and Resubmit: Indicates the submittals to be revised and resubmitted for review prior to proceeding with the work or that submittal does not require with contract documents.
      c. (Re)Submit Specific Item: Indicates that an item is missing from the submittal which was required by the specifications. The submittal cannot be properly reviewed until all parts requested are submitted. Upon review and return of specific item(s) indicated, the remaining portions of the submittal will bear the action indicated on the stamp.
      d. Rejected: Indicates the submittals do not comply with the contract documents and are rejected.

F. Submittals for Information: The architect will electronically stamp each submittal indicating the following:
   1. Received: Indicates the submittal has been received. Any actions necessary will be handled through other appropriate project communication channels.
   2. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

END OF SECTION

SECTION 01 3216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.02 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

1.03 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

B. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Provide sub-schedules to define critical portions of the entire schedule.

E. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

F. Coordinate content with schedule of values specified in Section 01 2000 - Price and Payment Procedures.

G. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.04 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

3.05 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

SECTION 01 3500

SPECIAL PROCEDURES

PART I - GENERAL

1.01 COVID RESPONSE

A. RRCo does not intend this section to be a definitive statement of the protocols and procedures that are applicable to this project. Nor are we endeavoring to provide legal or other professional advice. This section should NOT be construed as legal advice or any other expression of the scope or nature of a construction contractor's legal obligation to provide employment and a safe place of employment to its employees, particularly under the unprecedented circumstances that the COVID-19 outbreak has created. In addition, new and better information could well supersede the information included in this document. As the situation evolves, construction contractors shall continue to monitor the environment in which they are working and to related developments and react accordingly. All executive orders, laws and guidelines from the federal, state and/or local government shall be followed.

B. This section is based on information available from the CDC and OSHA at the time of its development and is subject to change based on further information provided by the CDC, OSHA, and other public officials. The contractor is responsible for amending their COVID Response Plan as new guidance and regulations emerge throughout the project. The initial plan must be submitted within 3 days of the contract award. Revised plans must be submitted to all interested parties including but not limited to the owner and architect as they become effective.

C. The COVID Response Plan must be site specific and must include guidance on the following minimum topics:
   1. Preventative guidance
   2. COVID-19 symptoms
   3. Worker self-screening
   4. Stay home guidance
   5. Worker training procedures
   6. Job site protective measures
      a. Meeting guidelines
      b. Social distancing guidelines
      c. PPE: Use of mandatory PPE such as glasses, gloves, …..etc
      d. Gatherings
      e. Hand sanitation
      f. Routine job site cleaning and disinfecting – Procedures to clean and sanitize surfaces
      g. Sharing tools guidelines – Measures to disinfect the site, tools, equipment, deliveries, ….etc.
      h. Placing sufficient number of portable hand washing and sanitizing stations
      i. Regular cleaning and disinfection of toilet facilities
   7. Job site visitor procedures
   8. Reporting protocols to team members, Owner and Architect
   9. Plan if job site exposure to COVID-19
   10. Protocols to track, screen, and report on the health of workers, with procedures for how to remove suspected infected individuals

D. All guidance must comply with OSHA and CDC recommendations including but not limited to:
   1. CDC Coronavirus:
      a. https://www.cdc.gov/coronavirus/2019-ncov
      b. https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/summary.html
      c. https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html
      d. https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-at-higher-risk.html

2. OSHA Coronavirus: https://www.osha.gov/SLTC/covid-19/
3. Executive Orders

E. Control and Prevention: https://www.osha.gov/SLTC/covid-19/controlprevention.html
1. Training
   a. https://www.osha.gov/SLTC/personalprotectiveequipment/
   b. https://www.osha.gov/SLTC/respiratoryprotection/training_videos.html
2. PPE: https://www.osha.gov/SLTC/personalprotectiveequipment/

F. PPE General requirements:
https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.132
1. Respiratory Protection:
   https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.134
2. Hand Protection:
   https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.138
3. Eye and Face Protection:
   https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.133
4. Disinfectants for Use Against SARS-CoV-2:
   https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2
5. Cleaning and Disinfecting Your Facility:
   https://www.cdc.gov/coronavirus/2019-ncov/community/disinfecting-building-facility.html
6. Hazard Recognition: https://www.osha.gov/SLTC/covid-19/hazardrecognition.html
7. Telework Guidance and Resources: https://www.cisa.gov/telework

G. The plan must be submitted within 3 days and then “accepted by Owner”.

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. References and standards.

C. Testing and inspection agencies and services.

D. Control of installation.

E. Mock-ups.

F. Tolerances.

G. Manufacturers' field services.

H. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 00 3100 - Available Project Information: Submittal procedures.

B. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

D. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

E. Section 01 4216 - Definitions.

F. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.04 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

SECTION 01 4216

DEFINITIONS

PART 1 GENERAL

1.01 SUMMARY

A. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

A. Demo: Remove, dispose of unless otherwise noted.

B. Furnish: To supply, deliver, unload, and inspect for damage.

C. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.

D. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

E. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.

F. Provide: To furnish and install.

G. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary sanitary facilities.

C. Security requirements.

D. Vehicular access and parking.

E. Waste removal facilities and services.

1.02 TEMPORARY UTILITIES

A. Owner will provide the following:

1. Electrical power and metering, consisting of connection to existing facilities. Contractor connection to existing convenience electrical outlets is permitted, but contractor shall furnish generators to power all construction equipment for project work.
2. Water supply, consisting of connection to existing facilities.

B. Owner will provide and pay for convenience water required for construction purposes.

C. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.03 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

C. At end of construction, return facilities to same or better condition as originally found.

1.04 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.05 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.06 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

1.07 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

F. Existing parking areas may be used for construction parking. Parking to be confined to areas and times determined by Owner.

1.08 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.09 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

D. **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. Where a Basis of Design Product is specified, the project shall be assumed to have been designed to accommodate all the requirements of the Basis of Design Product. Should the acceptable alternate product be used, the Contractor shall bear the cost of modifications which may be required to accommodate the alternate product.
   2. Modifications that may be required include but are not limited to:
      a. Alterations due to physical size and weight of equipment.
      b. Electrical power and grounding requirements.
      c. Cabling, auxiliary equipment, and controls.
      d. Water and sanitation requirements.
      e. Heating, air-conditioning and ventilation requirements.
   3. The cost of modifications shall include the cost of re-engineering and revisions to drawings and specifications, as required. These costs shall be paid directly from the Contractor to the Architect.

2.03 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.02 STORAGE AND PROTECTION

A. Designate receiving/storage areas (authorized by Owner) for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Do not store products directly on the ground.

J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

O. Do not inhibit use of:

1. Fire exists.
2. Parking.
3. Owner's operations.

P. Store combustible materials in accordance with specified regulations and away from non-combustible materials.

END OF SECTION

SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition.

C. Pre-installation meetings.

D. Cutting and patching.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.02 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.03 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
   2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.

H. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

I. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

J. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.04 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.
   3. Relocate items indicated on drawings.
   4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.

4. Verify that abandoned services serve only abandoned facilities.
5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

J. Clean existing systems and equipment.

K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

L. Do not begin new construction in alterations areas before demolition is complete.

M. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material , to full thickness of the penetrated element.

J. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

H. Prohibit traffic from landscaped areas.

I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel in accordance with manufacturers' instructions.

F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

G. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Testing, adjusting, and balancing HVAC systems: See Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

3.12 FINAL CLEANING

A. Execute final cleaning prior to Substantial Completion.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Replace filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, area drains, and drainage systems.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

J. Clean Owner-occupied areas of work.

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Accompany Project Coordinator on Contractor's preliminary final inspection.

H. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

I. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Field changes of dimension and detail.
   2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Additional information as specified in individual product specification sections.

D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Include test and balancing reports.

K. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Product data, shop drawings, and other submittals.
      c. Operation and maintenance data.
      d. Field quality control data.
      e. Original warranties and bonds.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 02 4100

DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of built site elements.

B. Selective demolition of building elements for alteration purposes.

C. Abandonment and removal of existing utilities and utility structures.

1.02 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with requirements in Section 01 7000.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Comply with applicable requirements of NFPA 241.
   3. Use of explosives is not permitted.
   4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   5. Provide, erect, and maintain temporary barriers and security devices.
   6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   8. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
   9. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
   10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

C. Do not begin removal until receipt of notification to proceed from Owner.

D. Do not begin removal until built elements to be salvaged or relocated have been removed.

E. Protect existing structures and other elements to remain in place and not removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

F. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

G. Hazardous Materials:

1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.

H. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.02 EXISTING UTILITIES

A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.

3.03 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
   1. Verify construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from areas that remain occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.

D. **The Contractor shall be SOLELY responsible for maintaining a weathertight and watertight exterior enclosure during all demolition work for the project.**

E. Remove existing work as indicated and required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
   2. Remove items indicated on drawings.

F. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and Security): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. See Section 01 1000 - Summary for limitations on outages and required notifications.
   4. Verify that abandoned services serve only abandoned facilities before removal.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

G. Protect existing work to remain.
    1. Prevent movement of structure. Provide shoring and bracing as required.
    2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
    3. Repair adjacent construction and finishes damaged during removal work.
    4. Patch to match new work.

3.04 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove materials not to be reused on site; do not burn or bury.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 03 0516

UNDERSLAB VAPOR BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor barrier under concrete slabs on grade.

1.02 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011 (Reapproved 2017).

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products.

C. Samples: Submit samples of underslab vapor barrier to be used.

D. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms, maximum.
   2. Complying with ASTM E1745 Class A.
   3. Thickness: 15 mils.
   4. Basis of Design:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com/#sle.
      b. W.R. Meadows, Inc.; Perminator (15-mil): www.wrmeadows.com.
      c. ISI Building Products; Viper II: www.isibp.com.

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

C. Lap joints minimum 6 inches.

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 321313 “Concrete Paving” for site construction applications.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture.
1. Concrete mix designs must be submitted a minimum of 15 days prior to the start of the work for engineer approval prior to the placement of concrete. Any adjustments in approved mix designs including changes in admixtures must be submitted in writing to the engineer and testing laboratory for approval prior to use. All mix design submittals shall clearly indicate the use and location of the particular mix.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement.
1. The Contractor shall neither use nor reproduce any part of the Design Drawings as part of the Shop Drawings.
2. At least one copy of each approved shop drawings shall be kept available in the Contractor’s field office. Drawings not bearing “Reviewed – No Exceptions” or “Reviewed – Exceptions Noted” stamps by the Engineer shall not be kept on the job site.

1.3 INFORMATIONAL SUBMITTALS

A. Material certificates.

B. Material test reports.

C. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.6 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1.

1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301.
2. ACI 117.
3. ACI 308.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.4 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I or Type III,.
2. Fly Ash: ASTM C 618, Class F or C.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C 595/C 595M, Type IS, portland blast-furnace slag, Type IP, portland-pozzolan, Type IL, portland-limestone, or Type IT, ternary blended cement.

B. Normal-Weight Aggregates: ASTM C 33/C 33M, graded.

1. Maximum Coarse-Aggregate Size: Not to be larger than one-fifth of the narrowest dimension between sides of forms, one-third the depth of slabs, nor three-fourths of the minimum clear spacing between individual reinforcing bars or bundles of bars.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C 260/C 260M.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

E. Water: ASTM C 94/C 94M and potable.

2.5 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A, except with maximum water-vapor permeance of 0.01 perms. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.6 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

H. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

I. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.7 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.8 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.9 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Normal-Weight Concrete:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 4 inches (8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture), plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

6. Minimum Compressive Strength:4000 psi at 28 days.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Vertical Construction Joints: Joints shall be located within the central third of the span. Any concrete spilling over or through the bulkhead shall be removed at the completion of the pour. All surfaces of the concrete shall have reinforcing extending through the joint. Where not otherwise shown on drawings, provide #4 bars at 12 inch o.c. x 4'-6' long.
   2. Horizontal Joints: Horizontal construction joints other than those shown on the drawings will not be permitted unless approved by the Architect.
   3. Joint Preparation: Forms shall be removed in time to permit roughening of construction joints of structural members by chipping and wire brushing to remove all loose and foreign material. The joints shall be dampened and the specified bonding compound applied. New concrete shall be placed after the rewettable bonding compound has dried or while the bonding grout or epoxy adhesive is still tacky. The anti-corrosive epoxy cementitious adhesive has a 20-hour open time.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated, or where not specifically shown, provide at maximum 15 feet or 36 times slab thickness, whichever is smaller, for slab on grade. Joints must be aligned and continuous. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. Cut joints within 12 hours after finishing. Joints shall be filled with the specified epoxy joint filler once contraction has occurred.

D. Construction Joints in Slabs-on-Grade: Butt joint with dowels shall be provided. For details, refer to typical joint construction detail on the drawings.

E. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

   1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 301.

E. Slabs on Grade: Place concrete slabs on grade by the long strip cast method. Refer to ACI 302 and 360 for recommended methods of placement. Maximum outside diameter of pipe or conduit placed in slabs on grade shall be limited to one-third the thickness of the slab. The minimum concrete cover top and bottom shall be one-third the thickness of the slab. Separate parallel pipes to permit concreting between and below them.

F. Rainy Weather Placement: Concrete shall not be placed during rain. Sufficient coverings shall be provided and kept on hand for protection during rainstorms. Prior to placing concrete, wind speed and dew point shall be monitored and recorded to control plastic shrinkage cracking. The guidelines of CACI 318, ACI 305R, and ACI 306R as applicable, shall be followed. The contractor, at a minimum, shall provide wind screens as required to minimize this condition.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where exposed to public view:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1 part portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

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F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures, for a minimum of 7 days. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing

operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to 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.

    a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. With prior approval of the Engineer, as to method and procedure, all repairs of defective areas shall conform to ACI 301, Section 5.3.7.

3.11 FIELD QUALITY CONTROL

A. Special Inspections: Contractor will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION 03 3000

SECTION 04 2000

UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Clay facing brick.

C. Mortar and grout.

D. Reinforcement and anchorage.

E. Flashings.

F. Lintels.

G. Accessories.

1.02 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.

D. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016, with Editorial Revision (2018).

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.

F. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2017.

G. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2021.

H. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2021.

I. ASTM C91/C91M - Standard Specification for Masonry Cement; 2018.

J. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2017.

K. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

L. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

M. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

N. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2021.

O. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a.

P. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.

Q. ASTM C476 - Standard Specification for Grout for Masonry; 2019.

R. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units; 2021.

S. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

T. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

U. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.

V. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls; 2005.

W. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.

X. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.04 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, and Samples for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.

D. A sample brick panel shall be provided by the Contractor and must be approved by the Architect.

E. Samples: Submit four samples of facing brick units to illustrate color, texture, and extremes of color range.

F. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 MOCK-UPS

A. Construct a masonry wall as a mock-up panel sized 4 feet long by 4 feet high; include mortar, accessories, structural backup, flashings (with lap joint, corner, and end dam), and wall insulation in mock-up.

B. Locate where directed.

C. Mock-up may remain as part of work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Masonry with chips larger than 1/4-inch shall not be used.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Special Shapes: Provide non-standard blocks configured for corners, lintels and control joint edges.
   2. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
   3. Special Shapes: Provide nonstandard blocks configured for corners and other detailed conditions.
      a. Provide bullnose units for outside corners and where indicated on drawings.
   4. Load-Bearing Units: ASTM C90, normal weight.
      a. Hollow block, as indicated.
   5. Nonloadbearing Units: ASTM C129.
      a. Hollow block, as indicated.

b. Normal weight.

2.02 BRICK UNITS

A. Manufacturers:
   1. Belden Brick: www.beldenbrick.com/#sle.
   2. Bowerston Shale: www.bowerstonshale.com.
   3. Hebron Brick Company: www.hebronbrick.com.
   4. Glen-Gery Corporation: www.glengery.com.

B. Facing Brick: ASTM C216, Type FBS or FBX, Grade SW. No cracked brick shall be installed, nor brick with chips larger than 1/4-inch. Since the designations of FBS and FBX have to do with dimensional tolerances rather than the ability of the material to withstand weathering, either type may be used.
   1. Color and texture to match Architect's sample.
   2. Nominal size: 4 inch by 4 inch by 12 inch.
   3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
   4. Compressive strength: 2500 psi, measured in accordance with ASTM C67/C67M.

2.03 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample. Air-entraining type.

B. Hydrated Lime: ASTM C207, Type S.

C. Mortar Aggregate: ASTM C144.

D. Grout Aggregate: ASTM C404.

E. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.

F. Water: Clean and potable.

2.04 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   1. Blok-Lok Limited: www.blok-lok.com/#sle.
   2. Dur-O-Wal: www.dur-o-wal.com.
   3. Hohmann & Barnard, Inc: www.h-b.com/sle.
   4. WIRE-BONDwww.wirebond.com/#sle.

B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; galvanized.

C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Type: Truss or ladder.
   2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B.
   3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

E. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Type: Truss, with adjustable ties spaced at 16 in on center.
   2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B.
   3. Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
   4. Vertical adjustment: Not more than 1 1/4 inches.

5. Seismic Feature: Provide lip, hook, or clip on extended leg of wall ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.
6. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.

F. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, stainless steel.
1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
3. Vertical adjustment: Not less than 2 inches.
4. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.

G. Partition Top Anchors: 0.105 inch thick metal plate with 3/8 inch diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
1. Hohmann & Barnard, Inc.; PTA 420.

H. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

2.05 FLASHINGS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual".

B. Metal Flashing Materials: Stainless Steel, as specified in Section 07 6200.

C. Factory-Fabricated Flashing Corners and End Dams: Stainless steel.

D. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.

E. Termination Bars: Stainless steel; compatible with membrane and adhesives.

F. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.06 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Joint Filler: Closed cell polyethylene; oversized 50 percent to joint width; self expanding; in maximum lengths available.

C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
1. Mortar Diverter: Semi-rigid mesh designed for installation at bottom of wall and all flashing locations.

D. Weeps:
1. Type: Molded PVC grilles, insect resistant.
2. Color(s): As selected by Architect from manufacturer's full range.

E. Cavity Vents:
1. Type: Molded PVC grilles, insect resistant.
2. Color(s): As selected by Architect from manufacturer's full range.

F. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.07 LINTELS

A. All exterior lintels and shelves shall be hot-dipped galvanized steel or stainless steel.

B. Refer to structural drawings for required minimum bearing on each side of opening.

2.08 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior, loadbearing masonry: Type N.
   3. Exterior, non-loadbearing masonry: Type N.
   4. Interior, loadbearing masonry: Type N.
   5. Interior, non-loadbearing masonry: Type O.

B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 INSTALLATION - GENERAL

A. Mortar joints shall be tooled concave. Raked mortar joints are specifically prohibited. Mortar joints (vertical, head or bed joints) shall not exceed 3/8-inch unless necessary to match existing masonry.

B. Masonry units shall be dry just prior to installation. Provisions, such as the use of tarps, shall be made to protect the material from weather.

C. Expansion joints shall be provided within 5 feet of each corner (both ways) and no less than 20 feet apart. See BIA tech-note 18A for detailed information.

3.05 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave.

D. Brick Units:
   1. Bond: Running.

2. Coursing: Two units and two mortar joints to equal 8 inches.
3. Mortar Joints: Concave.

3.06 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Interlock intersections and external corners.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

H. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

I. Isolate masonry partitions from vertical structural framing members with a control joint.

J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.07 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels, at bottom of walls, and at locations shown on drawings. Weeps shall be installed with a minimum of two per lintel.

B. Install cavity vents in veneer and cavity walls at 24 inches on center horizontally below shelf angles and lintels, near top of walls, and at locations shown on drawings.

3.08 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.09 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

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 continuous joint reinforcement in first and second joint below top of walls.

D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.

E. Lap joint reinforcement ends minimum 6 inches.

F. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

G. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

3.10 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

B. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

3.11 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at nonmasonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Through wall flashing shall be provided above all items such as shelf angles, doors, windows and lintels and below all copings, sills, caps and bottom courses. Flashing shall project 1/4-inch or more past the face of the brick or lintel, to provide a drip edge. Through wall flashing shall be stainless steel. Flexible or self-adhesive flashing materials may only be used to cover the upper termination of the through wall flashing within the cavity. Flashing at lintels, etc. shall be provided with end dams. End dam construction shall feature welded or soldered corners that do not rely solely on sealant for water tight integrity.

C. Terminate flashing up 8 inches minimum on vertical surface of backing:
   1. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer92s directions.
   2. Terminate vertical leg of flashing into bed joint in masonry or reglet in concrete.
   3. Anchor vertical leg of flashing into backing with a termination bar and sealant.
   4. Apply cap bead of sealant on top edge of self-adhered flashing.

D. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

E. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.

F. Support flexible flashings across gaps and openings.

G. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.12 LINTELS

A. Install loose steel lintels over openings.

B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
   1. Openings to 42 inches: Place two, No. 3 reinforcing bars 1 inch from bottom web.
   2. Openings from 42 inches to 78 inches: Place two, No. 5 reinforcing bars 1 inch from bottom web.
   3. Openings over 78 inches: Reinforce openings as detailed.
   4. Do not splice reinforcing bars.
   5. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
   6. Place and consolidate grout fill without displacing reinforcing.
   7. Allow masonry lintels to attain specified strength before removing temporary supports.

C. Maintain minimum 4 inch bearing on each side of opening.

3.13 GROUTED COMPONENTS

A. Reinforce bond beams with 2, No. 5 bars, 1 inch from bottom web, unless otherwise indicated.

B. Lap splices minimum 24 bar diameters.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

E. Place grout in low-lifts not exceeding 5 feet 4 inches.

F. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.14 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Size control joints as indicated on drawings; if not indicated, 3/8 inch wide and deep.

D. Form expansion joint as detailed on drawings.

E. Seal exterior side of all control and expansion joints, with a circular foam backer rod behind sealants to keep the sealant at a constant depth and provide a surface to tool the sealant against. The depth of the sealant should be one-half the width of the joint, with a minimum sealant depth of 1/4 inch.

3.15 BUILT-IN WORK

A. As work progresses, install built-in metal door frames, glazed frames, fabricated metal frames, window frames, anchor bolts, and plates and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.16 TOLERANCES

A. Maximum Variation from Alignment of Columns and Pilasters: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.17 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, grounds, and other penetrations. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.18 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

E. Final cleaning to be completed by using manufacturer recommended products.

3.19 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

3.20 SCHEDULES

A. Exterior Wall (colors based on Hebron Brick):
   1. Brick #1 Color (Field): Champagne.
   2. Brick #2 Color (Accent): Buckwheat.

END OF SECTION

SECTION 04 2200
CONCRETE UNIT MASONRY - LOADBEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units (CMU's) in load-bearing walls.
2. Steel reinforcing bars.

B. Related Sections:

1. Section 042000 "Unit Masonry" for flashing, repairing, pointing, joint reinforcing, and cleaning requirements.

1.2 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C140 for compressive strength.
2. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."

C. Samples: For each type and color of exposed masonry unit and colored mortar.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product indicated. For masonry units include material test reports substantiating compliance with requirements.

B. Mix Designs: For each type of grout. Include description of type and proportions of ingredients.
1. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

1.5 QUALITY ASSURANCE

A. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

B. 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.

1.6 PROJECT CONDITIONS

A. 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 ACI 530.1/ASCE 6/TMS 602.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength required to achieve the specified f'm, specified compressive strength of concrete masonry.
2. Density Classification: Normal weight.
3. Minimum Specified Compressive Strength of Masonry: 2,500 psi

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, 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.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate for Mortar: ASTM C 144.

1. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
2. White-Mortar Aggregates: Natural white sand or crushed white stone.
3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

D. Aggregate for Grout: ASTM C 404.

E. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

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. Euclid Chemical Company (The); Accelguard 80.
b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

F. Water: Potable.

2.4 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A615 or ASTM A996, Grade 60.

2.5 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82; with ASTM A153, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A1008, Commercial Steel, with ASTM A153, Class B coating.
3. Steel Plates, Shapes, and Bars: ASTM A36.

B. 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- diameter, hot-dip galvanized steel wire.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch diameter, hot-dip galvanized steel wire.

C. 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 1.05-inch- thick, steel sheet, galvanized after fabrication.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch diameter, hot-dip galvanized steel wire.

3. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from [01.05-inch-thick, steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch of masonry face.

D. Partition Top anchors: 0.105-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

E. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153.

F. Anchor Bolts: As indicated in drawings.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D226, Type I (No. 15 asphalt felt).

2.7 MORTAR AND GROUT 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. For exterior masonry, use portland cement-lime mortar.
3. For reinforced masonry, use portland cement-lime mortar.
4. 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 Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type S.
2. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
3. For interior non-load-bearing partitions, Type O may be used instead of Type N.

D. Grout for Unit Masonry: Comply with ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 3000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143.

PART 3 - EXECUTION

3.1 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 or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch 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, or 1/2 inch 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, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch 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, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.2 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. 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. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

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. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

F. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.3 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid 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.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.4 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 [**1/2 inch**] [**1 inch**] [**2 inches**] 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 o.c. vertically and 36 inches o.c. horizontally.

3.5 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.6 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 meet specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the "International Building Code."

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

F. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

3.7 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface. Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

END OF SECTION 04 2200

SECTION 04 2300
GLASS UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass masonry units.

B. Setting and pointing materials.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a.

C. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

D. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for glass units and accessories.

C. Samples: Submit two glass units illustrating color, design, and face pattern.

D. Manufacturer's Installation Instructions: Indicate special procedures, positioning of reinforcement, perimeter conditions requiring special attention.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Glass Units: Ten of each type, size, and pattern combination.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept glass units on site on pallets; inspect for damage.

1.06 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Units:
   1. Seves Glass Block, Inc; Thickset Nubio: www.sevesglassblock.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GLASS UNITS

A. Hollow Glass Units: Permanently seal hollow unit by heat fusing joint; factory coat unit edges to improve bond with mortar.
   1. Nominal Size: 8 inch by 8 inch by 4 inch.
   2. Color: Clear glass.
   3. Pattern and Design: Wavy, light-diffusive design on inner faces and smooth outer faces.

2.03 ACCESSORIES

A. Panel Reinforcement: Steel, galvanized after fabrication in accordance with requirements of ASTM A123/A123M:
   1. Side Rods: Two 3/16 inch diameter rods spaced 2 inch apart.
   2. Cross Rods: 1/16 inch diameter rods welded 8 inch on center.

B. Panel Anchors: Glass-block manufacturer's standard perforated steel strips, at least 20 gauge, 0.0359 inch thick by 1 3/4 inch wide; punched with three rows of elongated holes, pattern staggered, hot dip galvanized after fabrication in accordance with requirements of ASTM A123/A123M.

C. Fasteners, General: Provide Type 304 or Type 316 stainless-steel fasteners at interior walls. Select fasteners for type, grade, and class required.

D. Asphalt Emulsion: Water based, cold-applied asphalt emulsion complying with ASTM D 1187/1187M or ASTM D 1227.

2.04 MORTAR AND POINTING MATERIAL

A. Mortar for Glass Unit Masonry Assemblies: Provide mortar, mixed according to glass-block manufacturer's listing with testing and inspecting agency, for fire-resistance rating indicated.

B. Mortar: ASTM C270, Type S using the Proportion specification.
   1. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer unless otherwise indicated. Mix mortar to produce a stiff but workable consistency that is drier than mortar for brick or concrete masonry. Discard mortar when it has reached initial set.

C. Pointing Mortar: ASTM C270, Type S using the Proportion specification .

D. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): To match Architect's sample(s) when incorporated into specified mix design(s).

2.05 MORTAR MIXING

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, or antifreeze compounds unless otherwise indicated.
   1. Do not use calcium chloride in mortar.
   2. Limit cementitious materials in mortar to portland cement and lime.

B. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.

C. Add mortar color in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

D. Do not use anti-freeze compounds to lower the freezing point of mortar.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings are ready to receive work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean glass units of substances that may impair bond with mortar or sealant.

B. Establish and protect lines, levels, and coursing.

C. Protect elements surrounding the work of this section from damage and disfigurement.

3.03 INSTALLATION

A. Erect glass units and accessories in accordance with manufacturer's instructions.

B. Coat sill under units with asphalt emulsion as a bond breaker, and allow to dry.

C. Set panel anchors in mortar bed directly over coating.

D. Provide full mortar joints. Furrowing is not permitted. Remove excess mortar.

E. Maintain uniform joint width of 1/4 inch.

F. Place panel reinforcement at every second horizontal joint in full mortar bed and at first course above and below openings within the glass unit panel.

G. Lap reinforcement joints 6 inches. Discontinue reinforcement at expansion joints.

H. Isolate panel from adjacent construction on sides and top with expansion strips concealed within perimeter trim. Keep expansion joint voids clear of mortar.

I. Pointing With Mortar:
   1. Before mortar sets, rake out joints to depth of 5/8 to 3/4 inch.
   2. Fill joints with pointing mortar; press into joint to eliminate voids; neatly tool surface to a concave profile.
   3. Remove excess pointing mortar.

J. Clean glass unit masonry as work progresses. Remove mortar fins and smears immediately, using a clean, wet sponge or a scrub brush with stiff fiber bristles. Do not use harsh cleaners, acids, abrasives, steel wool, or wire brushes when removing mortar or cleaning glass unit masonry assemblies.

3.04 TOLERANCES

A. Variation From Joint Width: Plus 1/8 inch and minus 0 inches.

B. Maximum Variation from Plane of Unit to Adjacent Unit: 1/32 inch.

C. Maximum Variation of Panel from Plane: 1/8 inch.

3.05 CLEANING

A. On surfaces adjacent to glass unit masonry assemblies, remove mortar, sealants, and other residue resulting from glass-block installation, in a manner approved by manufacturers of materials involved.

B. Clean and polish faces of glass unit masonry, using materials and technique that will not scratch or deface units.

END OF SECTION

SECTION 04 7200
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural cast stone.

B. Units required are indicated on drawings as "cast stone".

C. Units required are:
   1. Exterior wall units, including sills.
   2. Other items indicated on drawings.

1.02 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2016.

D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.

F. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).

G. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a.

I. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.

J. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

K. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2019.

1.03 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, and Samples, for submittal procedures.

B. Product Data: Test results of cast stone components made previously by the manufacturer.

C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

D. Full-Size Samples, For Review:
   1. Basic Shapes: One of each.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. A firm with a minimum of 10 years experience producing cast stone of types required for project.
   2. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

1.05 MOCK-UP

A. Provide full size cast stone components for installation in mock-up of exterior wall.

B. See Section 01 4000 - Quality Requirements for additional requirements.
   1. Approved mock-up will become standard for appearance and workmanship.
   2. Mock-up may remain as part of the completed work.
   3. Remove mock-up not incorporated into the work and dispose of debris.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Cast Stone:
   1. Architectural Cast Stone: www.acscaststone.com.
   2. Prairie Stone: www.prairie-stone.com.
   3. Reading Rock, Inc.; RockCast: readingrock.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
   1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
   2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
   3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
   4. Color: Selected by Architect from manufacturer's full range.
   5. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.
   1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
   2. Unless otherwise indicated on drawings, provide:
      a. Wash or slope of 1:12 on exterior horizontal surfaces.
      b. Drips on projecting components, wherever possible.
      c. Raised fillets at back of sills and at ends to be built in.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.
   1. Pieces More than 24 inches in Any Dimension: Provide full length two-way reinforcement of cross-sectional area not less than 0.25 percent of unit cross-sectional area.

2.03 MATERIALS

A. Portland Cement: ASTM C150/C150M.

1. For Units: Type I or II, white.
2. For Mortar: Type I or II, except Type III may be used in cold weather.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.

E. Admixtures: ASTM C494/C494M.

F. Water: Potable.

G. Reinforcing Bars: ASTM A615/A615M, Grade 40 (40,000 psi), deformed bars, galvanized.
1. Galvanized in accordance with ASTM A767/A767M, Class I.

H. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.

I. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

J. Mortar: Portland cement-lime, ASTM C270, Type N; do not use masonry cement.

K. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 2000.

C. Mechanically anchor each cast stone unit.

D. Setting:
1. Drench cast stone components with clear, running water immediately before installation.
2. Set units in a full bed of mortar unless otherwise indicated.
3. Fill vertical joints with mortar.
4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.03 TOLERANCES

A. Joints: Make all joints 3/8 inch, except as otherwise detailed.
1. Rake mortar joints 3/4 inch for pointing.
2. Remove excess mortar from face of stone before pointing joints.
3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
4. Leave the following joints open for sealant:
   a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
   b. Joints in projecting units.
   c. Joints between rigidly anchored units, including soffits, panels, and column covers.
   d. Joints below lugged sills and stair treads.
   e. Joints below ledge and relieving angles.
   f. Joints labeled "expansion joint".

B. Installation Tolerances:
1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.

2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.
4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.04 REPAIR

A. Repairs: Repair chips and other surface damage noticeable when viewed in direct daylight at 10 feet.
   1. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.
   2. Repair methods and results subject to Architect 's approval.

3.05 CLEANING

A. Keep cast stone components clean as work progresses.

B. Clean completed exposed cast stone after mortar is thoroughly set and cured.
   1. Wet surfaces with water before applying cleaner.
   2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
   3. Remove cleaner promptly by rinsing thoroughly with clear water.
   4. Do not use acidic cleaners.

3.06 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

SECTION 05 0553

TAMPER PROOF METAL FASTENERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Tamper proof metal fasteners.
   2. Accessories.

1.03 SUBMITTALS

A. Product Data: For each type of product.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle per manufacturer's requirements.

PART 2 - PRODUCTS

2.01 TAMPER PROOF METAL FASTENERS

A. Exposed Security Fasteners:
   1. Torx-head (star design with center pin) security fasteners.
   2. Finish shall match that specified of the item anchored.

B. Fabrication:
   1. Fabricate removable tamper proof fasteners to allow removal only by tools produced by fastener manufacturer or other licensed fabricator specifically for individual tamper proof fastener design.
   2. Plating: Cadmium, zinc, nickel, phosphate and chrome to match adjacent materials.
   3. Limit size and shape variations such that no more than six (6) different tools are required for each type of tamper proof fastener used on project.

2.02 ACCESSORIES

A. Screw-thread Adhesive Sealant: Loctite No. 290 or acceptable substitute.

PART 3 - EXECUTION

3.01 LOCATIONS

A. Provide tamper proof metal fasteners to work under the General, Mechanical, and Electrical Contracts. This shall include fasteners for equipment, furnishings, fixtures, doors, windows, exposed structural connections, attachments and hardware.

B. Tamper proof metal fasteners shall be used for fastenings, except in the following areas:
   1. Administration and staff areas.
   2. Mechanical and electrical rooms.
   3. Areas above suspended ceilings, behind access panels and within pipe and duct chases.

3.02 INSTALLATION

A. Install work using proper sized tamper proof fastener, matched to configuration, structural loading, and size.

B. Install fasteners with the proper amount of torque as recommended by the manufacturer.

C. Set tamper proof fasteners with screw thread adhesive sealant in accordance with manufacturer's instructions.

D. Store and maintain inventory control for each installing tool used for installation of security fasteners. After use, installers shall return tools for inventory control. At completion of the project, installing tools shall be turned over to the facility.

3.03 SPARE PARTS

A. Provide five (5) security fastener kits to the Owner. Kits shall contain all fasteners found on project and a tool with bits.

END OF SECTION

SECTION 05 1200
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication of structural-steel components. The Contractor shall produce and submit Shop and Erection Drawings for the fabrication and erection of the Structural Steel and is responsible for the transfer of information from the Contract Documents into accurate and complete Shop and Erection Drawings and the development of accurate, detailed dimensional information to provide for the fit-up of parts in the field. The Contractor shall neither use nor reproduce any part of the Contract Documents as part of the Shop or Erection Drawings. Submitted shop drawings shall include layouts and details for each member showing the steel type and grade, size, connections, cuts, copes, holes, bolts, welds, surface treatments (cleaning, shop paint, etc.) and provisions for the connection of other work. Steel type, grade and size for all attached elements shall also be shown.

C. Submittal Letters: The Contractor shall submit for record letters from the Contractor's Engineer supervising the preparation of connection designs on shop and erection drawings.
1. A letter shall be submitted along with the first submission of Connection design calculations. It shall be signed and sealed by the Contractor's Engineer, and shall include the following:
    a. "All Connection design calculations for this project have been developed, and all details and connections for this project will be designed, by me, or by qualified personnel under my direct supervision, to resist the loads and reactions indicated on the Contract Documents, except for those connections which are designated as completely designed on the Contract Drawings."
2. A second letter shall be submitted upon the satisfactory submission, review and/or approval of all shop and erection drawings. It shall be signed and sealed by the Contractor's Engineer and include the following:

a. "All details and connections as shown on the final shop and erection drawings for this project have been designed by me, or by qualified personnel under my direct supervision, to resist the loads and reactions indicated on the Contract Documents, except for those connections which are designated as completely designed on the Contract Drawings."

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and Fabricator.

B. Welding certificates.

C. Mill test reports for structural steel, including chemical and physical properties.

D. Source quality-control reports.

E. Field quality-control and special inspection reports.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD**,** or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 360.
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360.
2. Use Allowable Stress Design; data are given at service-load level.

B. Moment Connections: Type FR, fully restrained.

C. Construction: Combined system of moment frame, braced frame, and shear walls.

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992, Grade 50.

B. Channels, Angles, S-Shapes: ASTM A 36.

C. Plate and Bar: ASTM A 36.

D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B structural tubing.

E. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating
2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.

C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

D. Unheaded Anchor Rods: ASTM F 1554, Grade 55, weldable.

1. Configuration: Straight.
2. Finish: Hot-dip zinc coating, ASTM A 153, Class C.

E. Headed Anchor Rods: ASTM F 1554, Grade 55, weldable, straight.

1. Finish: Hot-dip zinc coating, ASTM A 153, Class C.

F. Threaded Rods: ASTM A 36.

1. Finish: Hot-dip zinc coating, ASTM A 153, Class C.

2.4 PRIMER

A. Primer: SSPC-Paint 25, zinc oxide, alkyd, linseed oil primer.

2.5 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time. Grout shall also conform to Corps of Engineers specification for non-shrink grout, CRD-C621-83.

1. Twenty-eight day compressive strength as determined by grout cube tests shall be:
    a. 6,000 psi for supporting concrete 3000 psi and less;
    b. 8,000 psi for supporting concrete greater than 3000 psi and less than or equal to 4000 psi;
    c. 10,000 psi for supporting concrete greater than 4000 psi.

B. In addition, the grout manufacturer shall furnish test data from an independent laboratory indicating that the grout shall achieve 95% bearing contact under a 48”x48” base plate when placed at a fluid consistency.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.

B. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.8 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.
6. Surfaces enclosed in interior construction.

B. 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:

1. SSPC-SP 2, "Hand Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

3.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened, Pretensioned, Slip critical.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.4 TEMPORARY SUPPORT OF STRUCTURAL STEEL FRAME

A. The structure as shown on the Contract Documents is designed to withstand the design loads only when all structural elements are installed and fully connected. The contractor shall be responsible for the analysis of all components and assemblies for stresses and displacements that may be imposed by fabrication, shipping, handling, erection, temporary conditions, construction loads, etc. The analysis of such shall be performed by the Contractor's Engineer.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

END OF SECTION 05 1200

SECTION 05 2100
STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. Joist accessories.

B. The work under this section includes design, fabrication and erection of open web steel joists as indicated on the drawings, complete with bridging, attached seats and anchors, joist substitutes compatible with joist seat depths at short spans, labor, accessories and services necessary for the installation of joists and related work.

C. Include supplementary parts and members necessary to complete joist work, regardless of whether such parts and members are indicated on the Drawings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
3. The steel joist shop and erection drawings of the custom joists shall be prepared under and signed and sealed by a Structural Engineer licensed in State of Illinois.
4. The Manufacturer shall neither use nor reproduce any part of the Design Drawings as part of the Shop or Erection Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Manufacturer certificates.

C. Mill Certificates: For each type of bolt.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Vulcraft

2.2 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

2.3 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.4 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

C. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.5 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories.

B. Apply one coat of shop primer to joists and joist accessories.

C. Shop priming of joists and joist accessories is specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

G. The Contractor shall ensure that no cuts or holes are made in the members of the erected joists for attachment of ceiling, ducts, pipes or any other items not specifically shown in the contract drawings. The use of power driven fasteners in the diagonal and bottom chord members of the joists is prohibited.

H. The Contractor shall not hang any elements from the top or bottom chords of the joists except ceiling, ducts, pipes or other items specifically shown of the contract documents, without the written authorization of the Engineer. All pipes, ducts and other mechanical, electrical and plumbing equipment suspended from the joists shall have the hanger attached at a joist panel point only. All ceilings weighing 3 psf or less may have the grid hung anywhere along the bottom chord. Ceilings weighing more than 3 psf shall have the grid hung only at joist panel points. Heavy pipes, ducts, or other equipment hung from bar joists may require additional joist reinforcement and shall be referred to the engineer for framing.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Contractor to engage a qualified testing agency to perform tests and inspections.

B. Visually inspect field welds according to AWS D1.1/D1.1M.

C. Visually inspect bolted connections.

D. Prepare test and inspection reports.

END OF SECTION 05 2100

SECTION 05 3100
STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.

2. Acoustic Composite Cellular Floor Deck

1.2 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Evaluation reports.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 ROOF DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Type B: Wide Rib Deck
   a. Galvanized Steel Sheet: ASTM A653, Structural Steel (SS), Grade 33, G90 zinc coating.
   b. Profile Depth: As indicated.
   c. Design Uncoated-Steel Thickness: As indicated.

2.3 ACOUSTIC COMPOSITE CELLUAR FLOOR DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Type VLPA: Acoustic Composite Cellular Deck
   a. Galvanized Steel Sheet: ASTM A653, Structural Steel (SS), Grade 33, G60 zinc coating.
   b. Profile Depth: As indicated.
   c. Design Uncoated-Steel Thickness: As indicated.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners:
   1. Material: AISI 1070 modified
   2. Hardness: Minimum Rockwell Hardness C 54.5
   3. Strength: Minimum tensile strength 285 ksi; minimum shear strength 175 ksi
   4. Design and Manufacture: Knurled shank with forged ballistic point. Manufacturing process shall ensure steel ductility and prevent development of hydrogen embrittlement.
      a. Washers:
         1) For steel bar joist framing: Minimum 12 mm (0.472 in.) steel washers
         2) For structural steel framing: Minimum 15 mm (0.591 in.) steel washers
      b. Corrosion Resistance:
         1) For steel roof decks with waterproofing membrane: 5 micron zinc electroplated in accordance with ASTM B 633 SC1 Type III
         2) For exposed steel roof decks: Minimum AISI 304 stainless steel sealing caps with bonded neoprene washer shall be installed over each fastener
      c. Design Requirements:
         1) ICC-ES AC43 or SDI method for diaphragm shear strength and stiffness
         2) FM wind uplift resistance
         3) UL fire classification
      d. Approved Types
         1) For use with steel bar joist and light structural steel framing supports with top chord or flange thickness 1/8 in. to 3/8 in.:
            a) Hilti X-EDNK22 THQ12 (1/8 in. up to and including 1/4 in.)
            b) Hilti X-EDN19 THQ12 (3/16 in. up to and including 3/8 in.)
            c) Other approved alternative

2) For use with structural steel framing supports with top flange thickness 1/4 in. or thicker:
a) Hilti X-ENP-19 L15 (1/4 in. or thicker)
b) b) Other approved alternative

C. Sidelap Connectors
1. Mechanical sidelap connectors
a. Drive mechanical sidelap connectors completely through adjacent lapped roof deck sheets to achieve positive engagement of adjacent sheets with a minimum of three thread penetration.
b. Material: ASTM A 510 Grade 1022
c. Hardness: Minimum Vickers Surface Hardness of 450 HV0.3
d. Design and Manufacture: Hex washer head undercut with reverse serrations; self-piercing or stitch point at center
e. Corrosion Resistance:
1) For steel roof decks with waterproofing membrane: 5 micron zinc electroplated in accordance with ASTM B 633 SC1 Type III.
2) For exposed steel roof decks: AISI 410 or 304 stainless steel with bonded neoprene washer.
f. Design Requirements:
1) ICC-ES AC43 or SDI method for diaphragm shear strength and stiffness
2) FM wind uplift resistance
g. Approved Types
1) Hilti S-SLC01 M HWH Sidelap Connector
2) Hilti S-SLC02 M HWH Sidelap Connector
3) Hilti S-MD 10-16 x 3/4 HWH #3 Stainless Steel Screw
4) d) Other approved alternative

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

G. Galvanizing Repair Paint: ASTM A 780/A 780M SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.

H. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

C. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

D. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

E. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

F. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

G. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.

H. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

I. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

J. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

3.3 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

END OF SECTION 05 3100

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.

C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

D. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

E. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

F. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Plates: ASTM A283/A283M.

C. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of masonry; prime paint finish.

C. Lintels: As detailed; prime paint finish.

2.04 FINISHES - STEEL

A. Prime paint steel items.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5100

METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stairs with metal treads.

B. Structural steel stair framing and supports.

C. Handrails and guards.

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2021.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.

F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

G. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

H. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

I. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

J. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

K. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.

L. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

M. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

O. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Design Data: As required by authorities having jurisdiction.

D. Design Data, Seismic Performance: Submit documentation that stairs meet performance requirements specified.

1.04 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications:
   1. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
   2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
   3. Structural Design: Provide complete stair and railing assemblies that comply with the following:
      a. Stair Capacity: Uniform live load of 100 lb/sq ft and a concentrated load of 300 lb with deflection of stringer or landing framing not to exceed 1/360 of span.
      b. Railing Assemblies: Comply with applicable local code.
      c. Seismic Performance: Stairs designed to withstand the effects of earthquake motions determined according to ASCE 7.
         1) Component Importance Factor: 1.5.
         2) No permanent inelastic deformation occurs under movements equal 2.5 percent interstory drift, minimum.
   4. Dimensions: As indicated on drawings.
   5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   7. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Service: Exposed joints tight with face surfaces aligned; underside of stair not covered by soffit is not considered exposed to view.
      a. Welded Joints: Welded on back side wherever possible.
      b. Welds Exposed to View: Ground smooth; not required to be flush.
      c. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts or screw threads.
      d. Metal Surfaces to be Painted: Sanded smooth, suitable for satin or matte finish.
   2. Industrial: All joints made neatly.
      a. Welded Joints: Welded on back side wherever possible.
      b. Welds Exposed to Touch: Ground smooth.
      c. Bolts Exposed to Touch in Travel Area: No nuts or screw threads exposed to touch.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH METAL TREADS

A. Jointing and Finish Quality Level: Service, as defined above.

B. Risers: Closed.

C. Treads: Steel plate with abrasive coating.
   1. Tread Thickness: 1/4 inch, minimum.
   2. Anchorage to Stringers: Welded or bolted to carrier angles welded or bolted to stringers.

D. Risers: Steel sheet.
   1. Riser Thickness: As required by design; 14 gauge, 0.075 inch minimum.
   2. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.

E. Stringers: Rolled steel channels.
   1. Stringer Depth: 12 inches.
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

G. Railings: Steel pipe railings.

H. Finish: Shop- or factory-prime painted.

2.03 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
   1. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.

B. Guards:
   1. Top Rails: Round pipe or tube rails unless otherwise indicated.
      a. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.
   2. Infill at Pipe Railings: Pipe or tube rails sloped parallel to stair.
      a. Outside Diameter: 1 inch.
      b. Material: Steel pipe or tube, round.
      c. Vertical Spacing: Maximum 21 inches on center.
      d. Jointing: Welded and ground smooth and flush.
   3. End and Intermediate Posts: Same material and size as top rails.
      a. Horizontal Spacing: As indicated on drawings.
      b. Mounting: Welded to top surface of stringer.

2.04 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

2.05 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM A307, Grade A,.

B. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

D. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.

2.06 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
   2. Number of Coats: One.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on shop drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 06 1053

MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roofing nailers.

B. Preservative treated wood materials.

C. Communications and electrical room mounting boards.

D. Concealed wood blocking, nailers, and supports.

1.02 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2021.

D. PS 1 - Structural Plywood; 2009.

E. PS 20 - American Softwood Lumber Standard; 2020.

F. SPIB (GR) - Grading Rules; 2014.

1.03 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Spruce-Pine-Fir (South), unless otherwise indicated.
   2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No.2 or Standard Grade.
   2. Boards: Standard or No.3.

2.03 CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: PS 1, A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Treatment:
   1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.10 lb/cu ft retention.
      a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      b. Treat lumber in contact with masonry or concrete.
      c. Treat lumber less than 18 inches above grade.
      d. Treat lumber in other locations as indicated.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

3.03 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.04 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.

3.05 CLEANING

A. Waste Disposal:
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.

4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 4100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Countertops.

C. Hardware.

1.02 RELATED REQUIREMENTS

A. Section 12 3600 - Countertops.

1.03 REFERENCE STANDARDS

A. AWI (QCP) - Quality Certification Program; Current Edition.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. AWMAC (GIS) - Guarantee and Inspection Services Program; Current Edition.

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

E. BHMA A156.9 - Cabinet Hardware; 2020.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

G. UL (DIR) - Online Certifications Directory; Current Edition.

H. WI (CCP) - Certified Compliance Program (CCP); Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
   2. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet and countertop substrate and finish.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
   2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:
   1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
   2. Comply with AWMAC (GIS) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awmac.com/#sle.
   3. Comply with WI (CCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: https://woodworkinstitute.com/#sle.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.07 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Cabinets:
   1. Finish - Exposed Exterior Surfaces: Decorative laminate.
   2. Finish - Exposed Interior Surfaces: Decorative laminate.
   3. Finish - Semi-Exposed Surfaces: Decorative laminate
   4. Finish - Concealed Surfaces: Manufacturer's option.
   5. Door and Drawer Front Edge Profiles: Square edge with thin applied band.
   6. Door and Drawer Front Retention Profiles: Fixed panel.
   7. Casework Construction Type: Type A - Frameless.
   8. Interface Style for Cabinet and Door: Style 2 - Finish Inset; reveal overlay.
   9. Cabinet Design Series: As indicated on drawings.
   10. Adjustable Shelf Loading: 40 psf.
   11. Cabinet Style: Flush overlay.
   12. Cabinet Doors and Drawer Fronts: Flush style.
   13. Drawer Side Construction: Multiple-dovetailed.
   14. Drawer Construction Technique: Dovetail joints.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 LAMINATE MATERIALS

A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.04 COUNTERTOPS

A. Countertops: See Section 12 3600.

2.05 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

2.06 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments.

C. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.

D. Cabinet Catches and Latches:
   1. Type: Friction catch.

E. Drawer Slides:
   1. Type: Full extension with overtravel.
   2. Static Load Capacity: Extra Heavy Duty grade.

3. Mounting: Side mounted.
4. Stops: Integral type.
5. Features: Provide self closing/stay closed type.

F. Hinges: European style concealed self-closing type, steel with nickel-plated finish.

2.07 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

E. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor using appropriate angles and anchorages.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at cavity wall construction, perimeter foundation wall, and over roof deck.

1.02 RELATED REQUIREMENTS

A. Section 07 5400 - Thermoplastic Membrane Roofing: Installation requirements for board insulation over low slope roof deck.

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2019.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

C. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2019.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

B. Insulation Inside Masonry Cavity Walls: Extruded polystyrene (XPS) board.

C. Insulation Under Metal Wall Panels: Extruded polystyrene (XPS) board.

D. Insulation Over Roof Deck: Polyisocyanurate board. See Section 07 5400.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
   1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
   5. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   6. Board Edges: Square.
   7. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.
   8. Products:
      a. DuPont de Nemours, Inc; Styrofoam Brand Cavitymate Plus: building.dupont.com/#sle.
      b. Kingspan Insulation LLC; GreenGuard XPS Type IV, 25 psi: www.kingspan.com/#sle.
      c. Owens Corning Corporation; FOAMULAR Type 250 Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.

2.03 ACCESSORIES

A. Insulating Foam Sealant: Expanding polyurethane foram capable of filling, sealing, and insulating gaps up to 1 inch. For use in filling perimeter window and door shim spaces, and crevices in exterior building envelope.

B. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.

C. Insulation Fasteners: Appropriate for purpose intended.

D. Continuous Insulation (CI) Support Systems: Composite framing support (CFS) system consisting of insulated fiberglass reinforced plastic (FRP) girts that support CI and provide cladding attachment support integrated with metal wall panels exterior wall cladding.
   1. Substrate: Attach CFS system components to concrete masonry units (CMU).
   2. Depth of Girts: As required for thickness of insulation.
   3. Length: 6 inches for clips, and 96 inches for girts.
   4. Spacing of Girts: 24 inches on center, vertically.
   5. Products:
      a. Advanced Architectural Products, LLC; SMARTci GREENGirt System: www.smartcisystems.com/#sle.
      b. Armatherm; Z Girt Structural Thermal Break: www.armatherm.com/#sle.

E. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Apply adhesive to back of boards:
   1. Three continuous beads per board length.
   2. Full bed 1/8 inch thick.

B. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

C. Extend boards over expansion joints, unbonded to foundation on one side of joint.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT CAVITY WALLS

A. Adhere a 6 inches wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints between sheets.
   2. Extend sheet full height of joint.

B. Apply adhesive to back of boards:
   1. Three continuous beads per board length.
   2. Full bed 1/8 inch thick.

C. Install boards to fit snugly between wall ties.
   1. Place membrane surface against adhesive.
   2. Place membrane surface facing out, and tape seal board joints.

D. Install boards horizontally on walls.
   1. Place boards to maximize adhesive contact.

2. Install in running bond pattern.
3. Butt edges and ends tightly to adjacent boards and protrusions.
4. Place impale fastener locking discs.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BOARD INSTALLATION USING COMPOSITE FRAMING SUPPORT (CFS) SYSTEM

A. Install CFS system in accordance with manufacturer's installation instructions.

B. Install CFS system in compliance with system orientation, sizes, and locations as indicated on drawings.

C. Install CFS system to fill-in exterior wall spaces without gaps or voids, and do not compress insulation boards.

D. Trim insulation neatly to fit spaces, and insulate miscellaneous gaps and voids with approved expandable foam sealant.

3.05 BOARD INSTALLATION OVER LOW SLOPE ROOF DECK

A. Installation of board insulation over low slope roof deck, see Section 07 5400.

3.06 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2700
AIR BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air barriers.

1.02 DEFINITIONS

A. Air Barrier: Airtight barrier made of material that is virtually air impermeable but water vapor permeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

1.03 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.

B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

E. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

F. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2019.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

1.05 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Evaluated Air Barrier Assemblies; www.airbarrier.org/#sle: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

A. Air Barrier, Fluid Applied: Vapor semi-permeable, elastomeric waterproofing.
   1. Air Barrier Coating:
      a. Dry Film Thickness (DFT): 20 mil, 0.020 inch, minimum.
      b. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
      c. Water Vapor Permeance: 11 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method, at 73.4 degrees F.
      d. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 180 days of weather exposure.
      e. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.

f. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.
g. Comply with NFPA 285 requirements for wall assembly.
h. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
i. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
j. Products:
    1) Carlisle Coatings and Waterproofing, Inc; Fire Resist Barrithane VP: www.carlisleccw.com/#sle.
    2) DuPont de Nemours, Inc; Tyvek Fluid Applied WB+ with Tyvek Fluid Applied Flashing and Joint Compound, Sealant for Tyvek Fluid Applied System, and StraightFlash: building.dupont.com/#sle.
    3) Henry Company; Air-Bloc 17MR: www.henry.com/#sle.
    4) Hohmann & Barnard, Inc; ENVIRO-BARRIER VP: www.h-b.com/#sle.
    5) W.R. Meadows, Inc; Air-Shield TMP: www.wrmeadows.com/#sle.

2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.

B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement waived if not installed on roof.
    1. Width: 4 inches.

C. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready for work of this section.

B. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.

C. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Fluid-Applied Coatings or Membranes:
    1. Prepare substrate in accordance with manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
    2. Where exterior masonry veneer is being installed, install masonry anchors before installing air barrier over masonry; provide airtight seal around anchors.
    3. Apply bead or trowel coat of mastic sealant with minimum thickness of 1/4 inch along coating seams, rough cuts, and as recommended by manufacturer.
    4. Use flashing to seal to adjacent construction and to bridge joints in coating substrate.

E. Openings and Penetrations in Exterior Air Barriers:
    1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto air barrier and at least 6 inches up jambs; mechanically fasten stretched edges.

2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
4. At head of openings, install flashing under air barrier extending at least 2 inches beyond face of jambs; seal air barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.04 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 4213
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for exterior wall panels, with related flashings and accessory components.

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

C. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in installing products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.06 FIELD CONDITIONS

A. Do not install wall panels when air temperature or relative humidity are outside manufacturer's limits.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Wall Panels - Concealed Fasteners:
   1. Berridge Manufacturing Company; FW-12 Panel: www.berridge.com/#sle.
   2. Centria, a Nucor Company; IW Series Concealed Fastener Panels (IW-10A): www.centria.com/#sle.
   3. McElroy Metal; FW Panel: www.mcelroymetal.com/#sle.
   4. Metal Roofing Systems, Inc; Flush Seam Wall Panels: www.metalroofingsystems.biz/#sle.
   5. Morin Corporation; Concealed Fasteners F-12: www.morincorp.com/#sle.

6. Petersen Aluminum Corporation; Flush Wall Panels: www.pac-clad.com/#sle.

2.02 METAL WALL PANEL SYSTEM

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior wall panels.
   2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
   3. Design Pressure: In accordance with applicable codes.
   4. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
   5. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   6. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
   7. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
   8. Corners: Factory-fabricated in one continuous piece with minimum 2-inch returns.

B. Exterior Wall Panels:
   1. Profile: Vertical; style as indicated.
   2. Side Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets.
   3. Material: Precoated steel sheet, 22 gauge, 0.0299 inch minimum thickness.
   4. Panel Width: 12 inches.
   5. Color: As selected by Architect from manufacturer's full line.

C. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

D. Expansion Joints: Same material, thickness and finish as exterior sheets; manufacturer's standard brake formed type, of profile to suit system.

E. Trim, Closure Pieces, Caps, and Flashings: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

F. Anchors: Stainless steel.

2.03 MATERIALS

A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.04 FINISHES

A. Fluoropolymer Coil Coating System: Manufacturer's standard multi-coat metal coil coating system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss to match sample.

2.05 ACCESSORIES

A. Cladding Support Clips: Thermally-broken, galvanized steel clips for support of cladding z-girts, angles, channels, and other framing.
   1. Galvanized Steel Support Clip: G90/Z275 galvanized coating complying with ASTM A653/A653M support clip with integral glass fiber reinforced polyamide thermal isolator pad.
   2. Clip Depth: As indicated on drawings.

B. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

C. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 07 9200

D. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.

E. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, stainless steel. Fastener cap same color as exterior panel.

F. Field Touch-up Paint: As recommended by panel manufacturer.

G. Bituminous Paint: Asphalt base.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

3.02 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane, and spaced at intervals indicated.

B. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

3.03 INSTALLATION

A. Install panels on walls in accordance with manufacturer's instructions.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow to dry prior to wall panel installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports.

E. Lap panel ends 2 inches, minimum.

F. Provide expansion and control joints where indicated.

G. Use concealed fasteners unless otherwise indicated by Architect.

H. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.04 TOLERANCES

A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch, maximum.

B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch, maximum.

3.05 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.06 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 07 5400

THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adhered system with thermoplastic roofing membrane.

B. Insulation, flat and tapered.

C. Vapor retarder.

D. Deck sheathing.

E. Cover boards.

F. Flashings.

1.02 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2021.

D. ASTM D4434/D4434M - Standard Specification for Poly(Vinyl Chloride) Sheet Roofing; 2021.

E. NRCA (RM) - The NRCA Roofing Manual; 2022.

F. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.

C. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, and paver layout.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

G. Specimen Warranty: For approval.

H. Warranty Documentation:

1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
2. Submit installer's written verification that installation complies with warranty conditions for waterproof membrane.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum twenty years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this section with at least three years of documented experience and approved by manufacturer.

C. Upon completion of the installation and the delivery to the manufacturer by the Applicator of certification that all work has been done in strict accordance with the contract specifications and the manufacturer's requirements, a manufacturer's technical service representative shall review the installed roof system in accordance with providing a full System Warranty.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact, unless otherwise indicated.

B. Store materials in weather protected environment, clear of ground and moisture.

C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

D. Protect foam insulation from direct exposure to sunlight.

1.07 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. The minimum ambient and surface temperatures should be 40 degrees F and rising.

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. All surfaces to receive new insulation, membrane or flashings shall be dry. Should surface moisture occur, the Applicator shall provide the necessary equipment to dry the surface prior to application.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

F. All work shall be scheduled and executed without exposing the interior building areas to the effects of inclement weather. The building and its contents shall be protected against all risks.

G. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

H. All new and temporary construction, including equipment and accessories, shall be secured in such a manner as to preclude wind blow-off and subsequent roof or equipment damage.

I. Prior to and during application, all dirt, debris, and dust shall be removed from surfaces either by vacuuming, sweeping, blowing with compressed air or similar methods.

J. The Applicator shall take precautions that storage and aplication of materials and equipment does not overload the roof deck or building structure.

K. The Applicator shall adhere to all jobsite conditions prescribed by manufacturer.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
   1. Warranty Term: 20 years.
   2. For repair and replacement include costs of both material and labor in warranty.
   3. System includes:
      a. Design Peak Gust Wind Speed: 90 mph.
      b. Membrane, flashings, fasteners, and adhesives.
      c. Insulation.
      d. Cover board and deck sheathing.
      e. Vapor retarder.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain components including for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

B. Thermoplastic Polyvinyl Chloride (PVC) Membrane Roofing Materials:
   1. Carlisle SynTec Systems; Sure-Flex PVC: www.carlisle-syntec.com/#sle.
   2. Johns Manville: www.jm.com/#sle.
   3. Sika Corporation Roofing; Sarnafil PVC: usa.sika.com/sarnafil/#sle.
   4. Versico Roofing Systems; VersiFlex PVC: www.versico.com/#sle.

C. Insulation: Products approved by manufacturer for full System Warranty.

2.02 ROOFING - UNBALLASTED APPLICATIONS

A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered. Installed over cover board, insulation, deck sheathing, and vapor retarder.

B. Roofing Assembly Requirements:
   1. Installed roofing and base 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. Roofing and base flashings shall remain watertight.
      a. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested in accordance with ASTM G152, ASTM G154, or ASTM G155.
      b. Impact Resistance: Roofing system shall resist impact damage when tested in accordance with ASTM D3746 or ASTM D4272.
   2. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Acceptable Insulation Types - Constant Thickness Application:
   1. Minimum 2 layers of polyisocyanurate board.

D. Acceptable Insulation Types - Tapered Application:
   1. Tapered polyisocyanurate board.

2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

A. Membrane Roofing Materials:
   1. PVC: Polyvinyl chloride (PVC) complying with ASTM D4434/D4434M, Type III, sheet contains reinforcing fibers or reinforcing fabrics.
      a. Thickness: 60 mil, 0.060 inch, minimum.
   2. Sheet Width: Factory fabricated into widest possible sheets.
   3. Color: White.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Vapor Retarder: Material approved by roof manufacturer; compatible with roofing and insulation materials.
   1. Roofing membrane manufacturer's recommended self-adhering, rubberized asphalt or SBS modified bitumen membrane, laminated to polyethylene film top surface that can also serve as temporary roof protection; 30 mils thick, minimum.
   2. Fire-retardant adhesive.

D. Flexible Flashing Material: Same material as membrane.

2.04 DECK SHEATHING

A. Deck Sheathing: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
   1. Thickness: 1/2 inch, fire-resistant.
   2. Products:
      a. Georgia-Pacific; DensDeck Prime: www.densdeck.com/#sle.

b. USG Corporation; Securock: www.usg.com/#sle.

2.05 COVER BOARDS

A. Cover Boards: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
   1. Thickness: 1/2 inch, fire-resistant.
   2. Products:
      a. Georgia-Pacific; DensDeck Prime: www.densdeck.com/#sle.
      b. USG Corporation; Securock: www.usg.com.

2.06 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
   1. Classifications:
      a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
         1) Class 2 - Faced with coated glass fiber mat facers on both major surfaces of the core foam.
         2) Compressive Strength: Classes 1-2-3, Grade 2, 20 psi (138 kPa), minimum.
         3) Thermal Resistance, R-value: At 1-1/2 inches thick; Class 1, Grades 1-2-3, 8.4 (1.48), minimum, at 75 degrees F.
   2. Board Size: 48 by 48 inches.
   3. Board Thickness: 2.0 inches, maximum. Multiple layers as required to meet minimum insulating value indicated. Stagger joints of multiple insulation layers.
   4. Tapered Board: Slope as indicated; minimum thickness 1/2 inch; fabricate of fewest layers possible.
   5. Board Edges: Square.

2.07 ACCESSORIES

A. Provide all inside and outside corners, fasteners for base tie-in, termination bar, flashings, seals, and any other accessories required for a warrantable roof.

B. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

C. Sheathing Adhesive: Noncombustible type, for adhering gypsum sheathing to metal deck.

D. Sheathing Joint Tape: Heat resistant type, 2 inches wide, self adhering.

E. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches wide; self adhering.

F. Membrane Adhesive: As recommended by membrane manufacturer.

G. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

H. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.

I. Insulation Adhesive: As recommended by insulation manufacturer.

J. Strip Reglet Devices: Galvanized steel, maximum possible lengths per location, with attachment flanges.

K. Sealants: As recommended by membrane manufacturer.

L. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
   1. Composition: Roofing membrane manufacturer's standard.
   2. Size: Manufacturer's standard size.
   3. Surface Color: White.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system. All surfaces shall be smooth and free of dirt, debris, and incompatible materials.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify roof drains and scuppers have been properly installed.

F. Verify that roof openings, curbs, nailers, equipment supports, vents, and other penetrations through roof are solidly set and secured and prepared to receive new roofing materials, and cant strips, nailing strips, and reglets are in place.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION - METAL DECK

A. Install preformed acoustical glass fiber insulation strips in roof deck flutes in accordance with manufacturer's instructions; see Section 05 3100.

B. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's most current requirements. Remove sharp projections.

C. Install deck sheathing on metal deck:
   1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
   2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
   3. Tape joints.
   4. Fasten sheathing to roof deck with continuous mopping of adhesive.

3.03 INSTALLATION, GENERAL

A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.

B. Do not apply roofing membrane during cold or wet weather conditions.

C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

F. 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.

G. Coordinate installing roofing system components so insulation or roof boards are not exposed to precipitation or other sources of moisture.

H. Coordinate this work with installation of associated counterflashings installed by other sections as the work of this section proceeds.

I. For tie-in with existing building, install roofing and auxiliary materials to maintain weathertightness of transitions.

3.04 INSTALLATION - VAPOR RETARDER AND INSULATION AND COVER BOARD, UNDER MEMBRANE

A. Install vapor retarder to deck sheathing with adhesive in accordance with manufacturer's instructions, using primers as necessary.
   1. Extend vapor retarder under cant strips and blocking to deck edge.
   2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.

3. Completely seal vapor retarder at parapet terminations, obstructions, and penetrations to prevent air movement into roofing system.

B. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.

C. Attachment of Insulation: Embed each layer of insulation in adhesive in full contact, in accordance with roofing and insulation manufacturers' instructions. Allow adhesive to rise up approximately 1/8 inch and develop strings prior to setting insulation boards into adhesive.
   1. Walk insulation boards into the adhesive and roll with weighted steel roller per manufacturer's requirements to ensure full embedment.

D. Lay subsequent layers of insulation with joints staggered minimum 12 inches from joints of preceding layer.

E. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

F. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.

G. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

H. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.

I. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 24 inches.

J. All insulation boards must be butted together with no gaps greater than 1/4 inch. Fill gaps exceeding 1/4 inch with insulation. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

K. Do not install more insulation than can be covered with membrane in same day.

L. Cover boards: Adhere cover boards in accordance with roofing manufacturer's requirements.

3.05 INSTALLATION - MEMBRANE

A. The surface of the insulation shall be inspected prior to installation of the roof membrane. The substrate shall be clean, dry, free from debris, and smooth with no surface roughness or contamination. Broken, delaminated, wet, or damaged insulation boards shall be removed and replaced.

B. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Shingle joints on sloped substrate in direction of drainage. Apply roofing with side laps shingled with slope of roof deck where possible.

E. Ensure seam areas are free of debris, dirt, and dust, overlap membrane sheets, and hot-air weld side and end laps of roofing and sheet flashings

F. Fully Adhered Application: Apply adhesive to substrate at rate of manufacturer's required gallon per square foot. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

G. Overlap edges and ends and seal seams by heat welding, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

H. Install all membrane and preformed flashings according to roofing system manufacturer's most current requirements.

I. Install membrane base flashing by applying bonding adhesive to substrate and underside of membrane flashing at required rate. Do not apply to seam area of flashing.

J. Firmly roll membrane flashing into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

K. At intersections with vertical surfaces:

1. Extend membrane over cant strips and up a minimum of 8 inches onto vertical surfaces.
2. Fully adhere flexible flashing over membrane and up to reglets.
3. Insert flashing into reglets and secure.

L. Around roof penetrations, seal flanges and flashings with flexible flashing. Flash field penetrations and inside/outside corners with appropriate prefabricated flashing components or by approved custom in-field fabrication technique.

M. Coordinate installation of roof drains and sumps and related flashings. Spread continuous sealant bead leaving no gaps over deck drain flange at roof drains, and securely seal roofing in place with clamping ring.

3.06 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Owner will provide testing services, and Contractor to provide temporary construction and materials for testing in accordance with requirements. Contractor to provide temporary construction and materials for testing.

C. Provide periodic on-site attendance of roofing and insulation manufacturer's representative during installation of this work.

D. Arrange for roofing system manufacturer's technical personnel to inspect roofing installation upon completion.

E. Repair or remove and replace components of roofing system that do not comply with specified requirements.

F. Correct deficiencies in or remove roofing system that do 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.

G. Additional testing and inspection, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.07 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Remove bituminous markings from finished surfaces.

C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

D. Repair or replace defaced or damaged finishes caused by work of this section.

3.08 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 6200

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, exterior penetrations, and scuppers.

B. Sealants for joints within sheet metal fabrications.

C. Sheet metal splash pans.

1.02 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

C. ASTM B32 - Standard Specification for Solder Metal; 2020.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.04 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, and Samples for submittal procedures.

B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
   1. Identify material, thickness, weight, and finish for each item and location in Project.
   2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
   3. Details for fastening, joining, supporting, and anchoring sheet metal hoistway bevels including fasteners, clips, cleats, and attachments to adjoining work.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 FLASHING

A. Roof accessories: All roof accessories, such as curbs, shall have a two piece counter flashing.

B. Metal thickness shall be selected based on the exact size, configuration, and support conditions of the building. Consult SMACNA or NRCA for recommendations, but in all cases:
   1. The minimum thickness for aluminum is .040.
   2. The minimum thickness for stainless steel is 24 ga.

C. Lapped seams shall not be used. Non-moving seams shall be flat lock (2), common lock (1), or drive cleat (4), and shall be soldered (except aluminum).

D. Moveable seams shall be S pocket (6), Double S pocket (7) or butt seams with cover and/or backer plate (18, 20, 21). Seam types listed here refer to SMACNA figure 3-2.

2.02 SHEET MATERIALS

A. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 0.050 inch thick; plain finish shop pre-coated with fluoropolymer coating. Use at aluminum storefront locations.
   1. Fluoropolymer Coating: High performance organic powder coating, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Architect from manufacturer's full colors. Match aluminum storefront color.

B. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 24 gage, 0.025 inch thick; smooth No. 4 - Brushed finish. Use for all through wall flashing.

2.03 THROUGH WALL FLASHING

A. Through wall flashing shall be incorporated at the base of all walls where the masonry veneer sits on the concrete foundation, and where detailed. Through wall flashing (stainless steel) must securely terminate at the cavity face of the cmu back-up, and must extend through the brick or stone, and form a drip edge on the exterior of the wall.

B. Other applications of through wall flashing are discussed in Section 04 2000 - Unit Masonry.

2.04 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal and trim installation in existing substrates.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, and other suitable fasteners designed to withstand design loads, and suitable for materials being fastened. For fastening into treated wood, use hot-dipped galvanized steel, or stainless steel.
   1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating. Provide with neoprene washers.
   2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.

C. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

2.05 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet, minimum width in accordance with the Manufacturer's recommendations, interlocking with sheet.

C. Form pieces 96" minimum lengths, ten foot maximum; Fabricate splice plates.

D. Hem exposed edges on underside 1/2 inch; miter and seam corners.

E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

F. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

G. Flashing at lintels, sills, etc. and all other terminations shall be provided with end dams. End dam construction shall be 1" minimum in height and shall feature welded or soldered corners that do not rely solely on sealant for water tight integrity.

H. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

2.06 GUTTER AND DOWNSPOUT FABRICATION

A. Gutters: SMACNA (ASMM), Rectangular profile. Style "D".

B. Downspouts: Open-face profile. SMACNA 1-32H.

C. Gutters and Downspouts: Size indicated.

D. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
   2. Gutter Supports: Straps.
   3. Downspout Supports: Hangers; SMACNA 1-35I.

E. Splash Pans: Same metal type as downspouts. Terminate downspout elbow 1 inch above the back of the splash pan.
   1. Back Height: 4 inches greater than downspout.
   2. Back Width: 4 inches.
   3. Sides: Tapered from back height to 1 inch.
   4. Front Width: 18 inches.
   5. Length: 30 inches.

F. Seal metal joints.

G. Form gutters and downspouts of profiles and sizes indicated.

H. Fabricate with required connection pieces.

I. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

J. Hem exposed edges of metal.

2.07 EXTERIOR PENETRATION FLASHING PANELS

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

2.08 ACCESSORIES

A. Fasteners: Stainless steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Protective Backing Paint: Zinc molybdate alkyd.

D. Concealed Sealants: Non-curing butyl sealant.

E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

F. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

G. Reglets: Recessed type, galvanized steel.

H. Solder: ASTM B32; Sn50 (50/50) type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

A. Insert flashings into reglets to form tight fit; secure in place with lead wedges; pack remaining spaces with lead wool; seal flashings into reglets with sealant.

B. Secure flashings in place using concealed fasteners.

C. Apply plastic cement compound between metal flashings and felt flashings.

D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

E. Seal metal joints watertight.

F. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

G. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing 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 sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

H. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
   1. Wind Zone 1: For velocity pressures of 21 to 30 lbf/sq. ft.: 60-lbf/sq. ft. perimeter uplift force, 90-lbf/sq. ft. corner uplift force, and 30-lbf/sq. ft. outward force.

I. Water infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

J. Seal joints with elastomeric sealant as required for watertight construction.
   1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
   2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

K. Outlets shall be placed as near to the corner of the building as possible so that water will not be required to flow far beyond a sharp turn.

L. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters and scuppers to downspouts and accessories.

M. Secure gutters and downspouts in place with concealed fasteners.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07 7100
ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured roof specialties, including copings, fascias, and drip edges.

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.

C. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

D. NRCA (RM) - The NRCA Roofing Manual; 2022.

1.03 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, and Samples for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

1.04 WARRANTY

A. Provide a 2 year Contractor Installation Warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Roof Edge Flashings and Copings:
   1. Johns Manville: www.jm.com.
   2. Metal-Era Inc: www.metalera.com/#sle.
   3. Carlisle Syntec Systems: www.carlislesyntec.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Roof Edge PVC-coated Perimeter Drip Edges and Sheet Metal Flashings:
   1. Johns Manville: Presto-Weld Drip Edge: www.jm.com.
   2. Metal-Era Inc; One Drip Edge PVC version: www.metalera.com.
   3. Sika Corporation; Sarnaclad: usa.sika.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

C. Counterflashings:

2.02 COMPONENTS

A. Roof Edge Flashings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
   1. Configuration: Fascia, 5-1/2 inch face height, and edge securement for roof membrane.
   2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
   3. Anchor Bar: Extruded aluminum.
   4. Material: Formed aluminum sheet, 0.040 inch thick, minimum.
   5. Finish: 70 percent polyvinylidene fluoride.
   6. Color: As selected by Architect from manufacturer's full range.
   7. Products:
      a. Carlisle Syntec Systems; SecurEdge 2000: www.carlislesyntec.com.

b. Johns Manville; Presto-Tite Edge One Fascia System: www.jm.com..
c. Metal-Era Inc; Anchor-Tite Standard Fascia: www.metalera.com/#sle.
d. Substitutions: See Section 01 6000 - Product Requirements.

B. Roof Edge PVC-coated Drip Edge and Flashings: Factory fabricated coated metal used to terminate at perimeter of PVC membrane roofing, to sizes required; mitered, welded corners; concealed fasteners.
1. Coated metal edge system, 4-1/2 inch face height, with continuous cleat, and edge securement for roof membrane.
2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
3. Continuous Cleats: 22 ga. galvanized steel with slotted fastening holes.
4. Cover Material: 24 ga. galvanized drip edge, PVC coated.
5. Color: White.
6. Products:
a. Johns Manville: Presto-Weld Drip Edge: www.jm.com.
b. Metal-Era Inc; One Drip Edge PVC version: www.metalera.com.
c. Sika Corporation; Sarnaclad: usa.sika.com.
d. Substitutions: See Section 01 6000 - Product Requirements.

C. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
3. Wall Width: As indicated on drawings.
4. Outside Face Height: 6 inches.
5. Inside Face Height: 4 inches.
6. Material: Formed aluminum sheet, 0.040 inch thick, minimum.
7. Finish: 70 percent polyvinylidene fluoride.
8. Color: As selected by Architect from manufacturer's full range.
9. Products:
a. Metal-Era Inc; Edge Systems One Coping: www.metalera.com/#sle.
b. Carlisle Syntec Systems; SecurEdge One Coping: www.carlislesyntec.com.

D. Counterflashings: Factory fabricated and finished sheet metal that overlaps top edges of base flashing by at least 4 inches, and designed to snap into through-wall flashing or reglets with lapped joints.
1. Material: Stainless steel sheet, 24 gauge, 0.025 inch thick, minimum.

2.03 FINISHES

A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as selected from manufacturer's standard colors.

2.04 ACCESSORIES

A. Sealant for Joints in Linear Components: As recommended by component manufacturer.

B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

C. Factory-Fabricated Accessories: Provide manufacturer's inside and outside miters and endcaps.

D. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

B. Verify surfaces to support materials are clean, dry, straight, secure, and of proper dimensions.

C. Do not begin installation until unacceptable conditions are corrected.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Remove protective vinyl film immediately before installation.

C. Install materials to provide watertight termination at leading edge of roofing material.

D. Install materials to allow for thermal movement.

E. Seal joints within components when required by component manufacturer.

F. Anchor components securely.

G. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

H. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

I. Coordinate installation of flashing flanges into reglets.

3.03 ADJUSTING

A. Repair minor damages to finish in accordance with manufacturer’s instructions and as approved by Architect.

B. Remove and replace with new material, damaged components that cannot be successfully repaired, as determined by Architect.

3.04 CLEANING

A. Clean materials promptly after installation in accordance with manufacturer’s instructions.

B. Do not use harsh cleaning materials or methods that could damage finish.

3.05 PROTECTION

A. Protect installed materials to ensure that, except for normal weathering, materials will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof curbs.

B. Equipment rails.

C. Roof penetrations mounting curbs.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
   1. Applications: Roof curbs used for roof penetrations/openings as indicated on drawings, skylights, and equipment supports.
   2. Roof Curb Mounting Substrate: Curb substrate consists of corrugated metal roof deck with insulation.
   3. Sheet Metal Material:
      a. Aluminum: 0.080 inch minimum thickness, with manufacturer's standard alloy and temper.
         1) Finish: Mill finish.
   4. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing system at 1:1 slope; minimum cant height 4 inches.
   5. Provide layouts and configurations indicated on drawings.

B. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
   1. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.

C. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.
   1. Height Above Finished Roof Surface: 8 inches, minimum.

D. Pipe, Duct, or Conduit Mounting Curbs: Vertical posts, minimum 8 inches square unless otherwise indicated.
   1. Height Above Finished Roof Surface: 8 inches, minimum.

2.02 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES

A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly.
   1. Design Loadings and Configurations: As required by applicable codes.
   2. Height: Provide minimum clearance of 6 inches under supported items to top of roofing.
   3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
   5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

B. Pipe Supports: Provide attachment fixtures complying with MSS SP-58 and as indicated.
   1. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
   2. See relevant piping system specification section for additional requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

A. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2016a.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015.

D. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2015b, with Editorial Revision (2016).

E. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2013 (Reapproved 2017).

F. ITS (DIR) - Directory of Listed Products; current edition.

G. FM (AG) - FM Approval Guide; current edition.

H. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

I. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

J. UL (DIR) - Online Certifications Directory; Current Edition.

K. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

1.04 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Trained by manufacturer.

1.05 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:
   1. 3M Fire Protection Products: www.3m.com/firestop/#sle.
   2. Hilti, Inc: www.hilti.com/#sle.
   3. Nelson FireStop Products: www.nelsonfirestop.com/#sle.
   4. Specified Technologies Inc: www.stifirestop.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

C. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.
   2. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
   3. Air Leakage: Provide systems that have been tested to show L Rating as indicated.

B. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.

C. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.
   2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
   3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
   4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
   1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
   2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
   3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
   4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.04 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.

1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9100
PREFORMED JOINT SEALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precompressed pick-resistant foam seals.

1.02 REFERENCE STANDARDS

A. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's technical data sheets for each product, including chemical composition, movement capability, color availability, limitations on application, and installation instructions.

C. Color Cards: For color selection.

D. Manufacturer's Qualification Statement.

E. Installer's Qualification Statement.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section with at least three years of documented experience.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a two year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealers that fail to achieve watertight seal or exhibit loss of adhesion or cohesion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Precompressed Foam Seals:
   1. EMSEAL Joint Systems, Ltd: www.emseal.com/#sle.
   2. Nystrom, Inc: www.nystrom.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PRECOMPRESSED FOAM SEALS

A. Precompressed Foam Seal, Fire-Retardant Impregnated, Pick-resistant: Comprised of waterproof silicone faces on each side of fire-retardant impregnated foam sealant.
   1. Color: As selected by Architect.
   2. Size as required to provide water-tight seal when installed.
   3. Calculate size according to manufacturer's recommendations.
   4. Measure size of existing joints before selecting seal width.
   5. Fire-Rating: As indicated on drawings, comply with UL 2079.
   6. Applications:
      a. Exterior wall expansion joints.
      b. Building facade with seismic constraints.
   7. BASIS OF DESIGN Manufacturer:
      a. EMSEAL Joint Systems, Ltd; EMSHIELD Security Seal-SSW2: www.emseal.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

A. Adhesive: As recommended by seal manufacturer.

B. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and strip seal.

C. Substrate Cleaner: Non-corrosive, non-staining type recommended by seal manufacturer; compatible with joint forming materials.

D. Primer: Type recommended by seal manufacturer to suit application; non-staining.

E. Backing Tape: Self-adhesive polyethylene tape with surface that seal will not adhere to.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive this work.

B. Measure joint dimensions and verify that seal products are of the correct size to properly seal the joints.

3.02 PREPARATION

A. Properly prepare construction components adjacent to the work of this section to prevent damage and disfigurement due to this work.

3.03 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

B. Precompressed Foam Seals:

1. Install only when ambient temperature is within recommended application temperature range of adhesive. Consult manufacturer when installing outside this temperature range.
2. Prepare joints and install seals in accordance with manufacturer's written recommendations.
3. Remove loose materials and foreign matter that could impair adhesion of sealant.
4. Do not stretch precompressed seal; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION

A. Protect joints from damage until adhesives have properly cured.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.

B. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants; 2015a.

C. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2015.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2016.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

G. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.

H. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2002 (Reapproved 2013).

I. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015e1.

J. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2015.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

F. Executed warranty.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.

1. Adhesion Testing: In accordance with ASTM C794.
2. Compatibility Testing: In accordance with ASTM C1087.
3. Allow sufficient time for testing to avoid delaying the work.
4. Deliver sufficient samples to manufacturer for testing.
5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:
   1. Pecora Corporation: www.pecora.com/#sle.
   2. Sika Corporation: www.usa.sika.com/#sle.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Security sealant shall be applied continuously wherever a piece of security or detention equipment/fixture interfaces with a wall in order to fully close gaps.
   2. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to:
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   3. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. Other joints indicated below.
      c. All interior joints to be sealed shall use tamper-resistant security joint sealant.
   4. Do not seal the following types of joints:
      a. Intentional weep holes in masonry.
      b. Joints indicated to be treated with manufactured expansion joint cover, or some other type of sealing device.
      c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      d. Joints where installation of sealant is specified in another section.
      e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use nonsag tamper-resistant elastomeric polyurethane sealant, unless otherwise indicated.
   1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, noncuring.
   2. Lap Joints between Manufactured Metal Panels: Butyl rubber, noncuring.
   3. Control and Expansion Joints in Exterior Concrete Paving: Self-leveling polyurethane traffic-grade sealant.

C. Interior Joints: Use nonsag tamper-resistant elastomeric polyurethane sealant at Walls, Ceilings, and other joints, unless otherwise indicated.
   1. At and around Non-Moving Fixtures Where Tamper-Resistance is Required: Non-sag epoxy sealant.
   2. Narrow Control Joints in Interior Concrete Slabs: Self-leveling epoxy sealant.

D. Areas Where Tamper-Resistance is Required: At all locations.

E. Preformed Joint Seals: See Section 07 9100 for information.

2.03 JOINT SEALANTS - GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2.04 NONSAG JOINT SEALANTS

A. Tamper-Resistant, Silyl-Terminated Polyurethane (STPU) Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 12-1/2 percent, minimum
   2. Hardness Range: 45 to 55, Shore A, when tested in accordance with ASTM C661.
   3. Color: Match adjacent finished surfaces.
   4. Service Temperature Range: Minus 40 to 180 degrees F.
   5. Products:
      a. Pecora Corporation; Dynaflex: www.pecora.com/#sle.
      b. Sika Corporation; Sikaflex -2c NS TG: www.usa.sika.com/#sle.

B. Epoxy Sealant: ASTM C881/C881M, Type I and III, Grade 3, Class B and C; two-component.
   1. Hardness Range: 65 to 75, Shore D, when tested in accordance with ASTM C661.
   2. Compressive Strength: 11,000 psi, when tested in accordance with ASTM D695.
   3. Color: Match adjacent finished surfaces.
   4. Products:
      a. Pecora Corporation; DynaPoxy EP-1200 Two-Part Epoxy Security Sealant: www.pecora.com/#sle.
      b. Sika Corporation; Sikadur -23 Lo-Mod Gel: www.usa.sika.com.

C. Noncuring Butyl Sealant: Solvent-based, single component, nonsag, nonskinning, nonhardening, nonbleeding; non-vapor permeable; intended for fully concealed applications.

2.05 SELF-LEVELING JOINT SEALANTS

A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
   3. Color: Gray.
   4. Service Temperature Range: Minus 40 to 180 degrees F.

B. Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
   1. Composition: Multicomponent, 100 percent solids by weight.
   2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
   3. Color: Concrete gray.
   4. Joint Width, Minimum: 1/8 inch.
   5. Joint Width, Maximum: 1/4 inch.
   6. Joint Depth: Provide product suitable for joints from 1/8 inch to 2 inches in depth including space for backer rod.

2.06 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
   1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type C - Closed Cell Polyethylene.
   2. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Fire-rated hollow metal doors and frames.

C. Thermally insulated hollow metal doors with frames.

D. Hollow metal borrowed lites glazing frames.

1.02 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. ASCE: American Society of Civil Engineers.

C. HMMA: Hollow Metal Manufacturers Association.

D. NAAMM: National Association of Architectural Metal Manufacturers.

E. NFPA: National Fire Protection Association.

F. SDI: Steel Door Institute.

G. UL: Underwriters Laboratories.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2018.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2015.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2017.

I. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.

J. ASTM C476 - Standard Specification for Grout for Masonry; 2019.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

L. BHMA A156.115 - Hardware Preparation In Steel Doors And Steel Frames; 2016.

M. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

N. ITS (DIR) - Directory of Listed Products; current edition.

O. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

P. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

Q. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2007.

R. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

S. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

T. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

U. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

V. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2019.

W. UL (DIR) - Online Certifications Directory; Current Edition.

X. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

Y. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, and Samples for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

C. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:
   1. Curries, an Assa Abloy Group company: www.assaabloydss.com.
   2. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
   3. Pioneer Industries: www.pioneerindustries.com.
   4. Steelcraft, an Allegion brand: www.allegion.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Metal Doors and Frames:
   1. Face sheets are to be made of commercial quality 16 gauge cold rolled steel compliant with ASTM A1008.
   2. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   3. Accessibility: Comply with ICC A117.1 and ADA Standards.
   4. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.

5. Door Edge Profile: Edges may be square or beveled.
6. Typical Door Face Sheets: Flush.
7. Doors shall have seamless, welded edge construction. Doors shall have full height mechanically interlocked edges. At a minimum, edge seams are to be intermittently welded using 1" long welds, then seam filled with structural adhesive, and dressed smooth. Continuous welding is preferred.
8. Cores shall be continuously bonded to face sheets. Standard honeycomb cores are acceptable for most interior applications. Steel stiffened cores shall be provided for doors where heavier service is anticipated.
9. All doors shall have factory applied rust inhibitive primer.
10. Top and bottom edges shall be reinforced with 14 ga. galvannealed channels welded to both panels.
11. All doors shall have minimum 14 ga. closer reinforcement regardless of whether closers are specified for the specific opening.
12. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
13. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
14. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
    a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

B. Hollow Metal Panels: Same construction, performance, and finish as doors.

C. Provide doors and frames with preinstalled electrified wiring within frame and leaf to allow control of door hardware latch retraction functions or electrified strikes, etc., at all hollow metal door locations provided with electrified exit devices or locksets.

D. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.
1. Exterior doors shall meet all minimum construction requirements as interior doors. Additional features of exterior doors:
    a. Face sheets shall be commercial quality, 16 ga. galvanized steel.
    b. Tops of exterior doors are to be provided with additional steel caps to prevent moisture intrusion into the core. Caps may not be recessed. Attachment of cap shall be sealed prior to painting.
    c. Cores shall be polystyrene or polyurethane continuously bonded to face sheets.
2. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    a. Level 3 - Extra Heavy-duty.
    b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
    c. Model 1 - Full Flush.
    d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
    e. Conforming to ASTM A924 G90
    f. Galvanized face sheets to be welded to a steel channel frame.

1) Steel channel frame to be continuous all sides of door.
2) Plastic fillers are NOT acceptable.

3. Core Material: Polystyrene bounded to both face sheets.
   a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
4. Door Thickness: 1-3/4 inches, nominal.

C. Interior Doors, Non-Fire Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
   2. Core Material: Kraftpaper honeycomb (One piece).
   3. Door Thickness: 1-3/4 inches, nominal.

D. Fire-Rated Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
   2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
   3. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.
   4. Provide units listed and labeled by UL (DIR) or ITS (DIR).
      a. Attach fire rating label to each fire rated unit.
   5. Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
      a. Maximum Air Leakage: 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
      b. Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
      c. Label: Include the "S" label on fire-rating label of door.
   6. Core Material: Polystyrene bounded to both face sheets..
   7. Door Thickness: 1-3/4 inches, nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Knock-down hollow metal frames are **NOT** allowed.

D. Exterior Door Frames: Full profile/continuously welded type.
   1. SDI level 4. 14 ga. Hot dipped galvannealed steel conforming to ASTM A 653.
   2. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
   3. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
   4. Complies with ASTM A924 G90.

5. Frames to be constructed with closed and tight mitered seams. Weld seams and full web of frame, corner or intersection. Grind and dress smooth weld area. Apply a zinc rich primer over the grinding area, and finish with a matching prime paint.
6. Reinforce frame to accept closer, regardless of whether a closer is specified or not.
7. Weatherstripping: Separate, see Section 08 7100.

E. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
1. SDI level 3. 16 gauge minimum cold rolled or galvannealed steel ASTM A653.
2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
3. Frames to be constructed with closed and tight face miter seams. Weld face miter seams. Grind and dress smooth weld area, finish with a matching prime paint.
4. No knock-down hollow metal frames will be allowed.
5. Comply with ASTM A366 ir A620.
6. Reinforce frame to accept closer, whether a closer is specified or not.

F. Door Frames, Fire-Rated: Full profile/continuously welded type.
1. Fire Rating: Same as door, labeled.
2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
3. Reinforce frame to accept closer, whether a closer is specified or not.

G. Mullions for Pairs of Doors: Fixed, with profile similar to jambs.

H. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

I. Transom Bars: Fixed, of profile same as jamb and head.

J. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

K. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

L. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
1. Fire-Rated Frames: Comply with fire rating requirements indicated.

2.06 ACCESSORIES

A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
1. Size: As indicated on drawings.

B. Glazing: As specified in Section 08 8000, factory installed.

C. Removable Stops: Formed sheet steel, mitered or butted corners; prepared for countersink style tamper proof screws.

D. Astragals for Double Doors: Specified in Section 08 7100.

E. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

F. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

G. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

H. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Frames in Masonry Walls: Door frames in masonry walls shall be back-primed with bituminous coating and grouted solid. Provide a minimum of three anchors per jamb.

C. Install all door and frames in accordance with ANSI/SDI A250.8-2003 (R2008).

D. Install fire rated units in accordance with NFPA 80.

E. Coordinate frame anchor placement with wall construction.

F. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

G. Install door hardware as specified in Section 08 7100.
   1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

H. Comply with glazing installation requirements of Section 08 8000.

I. Coordinate installation of electrical connections to electrical hardware items.

J. Touch up damaged factory finishes.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 3463

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 beentested 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 satisfactorytests 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 D1.3test 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 classificationrating.

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 affect 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. Subcontractor should comply withANSI/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 damages 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 andglazing 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 operatedhardware, 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 meetingASTM 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/A653CSType 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 primeron steel surfaces unless otherwise specified.

2. Exterior doors and frames: Minimum one coat of manufacturer's standard rust-inhibitive primeron 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).l.

2. Internal Stiffeners: Internal stiffener construction shall extend full height of door, top to bottomat 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 fulldoor thickness between face sheets. Studs shall be fabricated from CRCQ steel materialsame as specified for doors and frames, minimum 18 gauge (0.0516-inch thickness) withvertical 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 chan-nel, 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 studsat 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 in each end of the channel.

6. Core Insulation: Minimum 8 pcf density mineral wool batt-type insulation. Fill spaces and voidscontinuous 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 agree to. Frames shall be welded construction formed to profiles indicatedwith backbends.

1. Corner joints: Construct with faces mitered and stops either butted or mitered with contact edgesclosed 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 stopsas 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 otherwiseindicated.
        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 abuttedmembers.
4. Field splicing: Provide for field splicing of frames only when shipping limitations restricts sizesof 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 thebottom of each jamb to brace fabrication during shipping, storage and handling. Frame installerto 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 anchoredin 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 shallbe 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 perjamb.

2.6 GLAZING STOPS AND MOLDINGS

A. Door Glazing Stops: Provide fixed steel moldings and removable stops for doors with glazed view open-ings to accommodate sizes and thickness of specified security glazing materials. Stops shall be fabricatedwith 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 andspot 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 securedto, 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 specfied 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 forframes 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 guardstight 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 faceof frame.

2. Fabricate back-up plate with 1.125-inch (1-1/8") diameter hole centered within square cut-out inframe 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: Minimum12 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) steelangle welded to back of frame face and hinge reinforcement to resist deformation underswinging 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 un scheduled provide key wells or hand holes for key access to lock.

E. Electric operated hardware and security system devices: Provide hardware enclosures and junction boxesinterconnected 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 framesto facilitate installation of wiring, electrical components and security system devices required tobe 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 bolt50-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 bedismantled 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 lockand 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 clearancesspecified 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 positionin 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 Doorsand 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 untilpermanent anchors are set.

a. Secure floor anchors at each jamb and mullion anchored to substrate.

b. 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 locationsspecified.

c. Build-in specified wall anchors for frames installed in masonry security walls as work isconstructed. Install specified jamb and head anchors with holes in straps aligned for insertion of reinforcement bars to secure frames to wall construction.

d. Install frames in prepared openings of in-place concrete or masonry wall construction using specified anchors at spacing and locations indicated.

3. Install fire-rated frames in accordance with NFPA 80-1995 using labeled anchors and same methods specified for installation in security walls.

4. 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 aligned 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 for 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 make adjustments to 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

Warranty is one year from date of project substantial completion.

End of Section

SECTION 08 3800
TRAFFIC DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corrosion resistant gate doors and frames.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's technical information for each type of door specified, including details about materials, components, profiles, gaskets, and finishes; include:
   1. Preparation and installation instructions and methods.
   2. Storage and handling requirements and recommendations.
   3. Operation and maintenance data.

C. Shop Drawings: Show installation details of doors and frames, including elevations and attachment.

D. Manufacturer's Qualification Statement.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver product in manufacturer's original unopened packages with label legible and intact.

B. Store doors at project site on edge or in upright position, under cover and elevated above grade, following manufacturer's instructions.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 RIGID AND SEMI-RIGID TRAFFIC DOORS

A. High Density Polyethylene Door: 1/2 inch thick stress relieved and sanitized HDPE with round edges. Anodized aluminum back spine riveted to door panel with concealed upper and lower stainless steel hinges.
   1. Maximum width of a single panel shall be 48 inches.
   2. Color: As selected by Architect from manufacturer's standard selection.
   3. Frames: Tubular steel by door manufacturer.
   4. Door stops shall be constructed with 1/2 inch thick stress relieved and sanitized high density polyethylene, used to limit the swing pattern.
   5. Manufacturers:
      a. Chase Doors; Corrections Corrosion Resistant Gate Door: www.chasedoors.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

A. Provide tamper proof fasteners and other hardware as recommended by manufacturer for complete installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that jambs and frames are square and plumb.

B. Verify that opening is ready to receive work and opening dimensions and clearances are as indicated on drawings.

C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.

D. Commencement of work by installer is acceptance of opening conditions.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

3.03 INSTALLATION

A. Install doors with clearances, anchors, hardware, and accessories according to the manufacturer's instructions and as specified.

B. Install doors plumb, level, and properly aligned.

3.04 ADJUSTING

A. Clean and lubricate operating parts.

B. Adjust doors to open and close smoothly and freely without binding and for proper fit of seals.

3.05 CLEANING

A. Clean surfaces using methods as recommended by manufacturer.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 08 4313

ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

1.02 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

C. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems; 2014.

D. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

E. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

F. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

I. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

K. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

L. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
   1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

D. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

E. Designer's qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.07 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum-Framed Storefronts:
   1. EFCO Corporation; www.efcocorp.com.
   2. Kawneer North America: www.kawneer.com/#sle.
   3. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
   4. Pittco Architectural Metals Inc: www.pittcometals.com/#sle.
   5. YKK AP America, Inc: www.ykkap.com/commercial/#sle.

2.02 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Center-Set Style, Thermally-Broken:
   1. Basis of Design: Kawneer Series AA4325 Ultra Thermal Windows.

2.03 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Rabbet: For 1 inch insulating glazing.
   2. Finish: Superior performing organic coatings.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
      c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   3. Finish Color: As selected by Architect from manufacturer's standard line.
   4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   7. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

8. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
10. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing, and heel bead of glazing compound.
11. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

B. Performance Requirements
1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
a. Design Wind Loads: Comply with requirements of ASCE 7.
b. Member Deflection: Limit member deflection to 1/175 in any direction, with full recovery of glazing materials.
2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 15 psf.
3. Air Leakage: 0.10 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 6.24 psf pressure difference.

2.04 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
1. Glazing Stops: Flush.
2. Cross-Section: As indicated on drawings.

B. Glazing: See Section 08 8000.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.

D. Concealed Flashings: Stainless steel, 26 gauge, 0.0187 inch minimum thickness.

E. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

F. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.06 FINISHES

A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.

B. Color: As selected by Architect from manufacturer's full range.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill and head flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Install glass using exterior wet/dry glazing method; see Section 08 8000.

J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.

B. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as directed by Architect.
   2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

C. Provide field testing of installed storefront system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as directed by Architect.
   2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
   3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
      a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.

D. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 5663

DETENTION WINDOWS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included:
1. Furnish all labor and materials to complete the fabrication of detention windows as shown on the architect's drawings and as specified herein. All detention windows covered by this specification shall be fabricated by Hope's Windows Inc., Jamestown, New York, whose name and products are used to establish the standard of workmanship and quality construction required for this project. The architect must approve other bidders at least fifteen days prior to the bid date, through submission of samples and evidence showing that the bidder has been fabricating detention window products of this type and quality for at least five years. All windows must be domestically manufactured in the U.S.A. All work shall include, but not be limited to, the following:
2. Formed steel maximum detention (or moderate detention) fixed thermally improved windows having horizontal or vertical steel detention bars spaced 6" on center concealed within the rails. The round detention bars shall penetrate the flat detention bars concealed in the frame to form an integral detention grid. (Minimum detention windows shall have no detention bars.)
3. All detention window anchors, mullions, covers and trim.
4. Factory applied Hope's finishes.
5. Aluminum exterior frame to have clear anodized finish.
6. Installation

B. Related work specified elsewhere:
1. Glass, glazing and glazing materials.
2. Perimeter caulking.
3. Miscellaneous structural items.
4. Anchors built in or encased in concrete, (embedment).

1.2 QUALITY ASSURANCE

A. Manufacturer shall have not less than (10) years experience in the fabrication of steel detention windows and be a member of The Steel Window Institute (SWI).

B. Experienced window installers shall do installation of windows.

C. Allowable tolerances: Size dimensions +/- 1/16 inch.

D. Source quality control:
1. Air infiltration test, meets or exceeds ASTM E283, maximum air infiltration .37 CFM/ Ft. of crack length with pressure differential across the window unit of 1.57 PSF.
2. Water penetration test, meets or exceeds ASTM E331, no water penetration for 15 minutes when the window is subjected to a rate of flow of 5 gal. /hr. /sq. ft. with differential pressure across the window unit of 2.86 PSF.
3. Tool-resisting steel meets or exceeds ASTM A627-03, Grade 4, submit test reports from a qualified independent testing laboratory verifying that the window manufacturer's tool-resisting steel are in conformance with ASTM A627-03.
4. Impact Test, meets or exceeds ASTM F1592-01 "Standard Test Methods for Detention Hollow Metal Vision Systems"

a. Impact Blows - Must withstand a minimum of 600 blows at each impact location (1200 total blows per frame without rail bar, 1800 total blows per frame with rail bar)

b. Glazing Test - The glazing and panels shall remain in place. No damage to the extent that forcible entry can be achieved.
c. Frame Test – No weld joints or the entire frame joint shall completely separate.
d. The wall anchoring shall retain the frame in place throughout the test procedure to the extent that forcible entry cannot be achieved.

5. Uniform Load Deflection Test: Test unit accordance with ASTM E330-97 at 65-psf.
6. Condensation Resistance Test (CRF): Test unit for thermal performance in accordance with AAMA 1503-98 with condensation resistance factor of at least 54.
7. Thermal Transmittance Test (Conductive U-Value): Test unit in accordance with AAMA 1503-98 with U-Value of 65 or less.
8. Forced Entry Resistance Test: Unit tested in accordance with ASTM F588-97 for Type B Grade 10.
9. Quality of e-coat/ top-coat combination shall meet or exceed the following ASTM designations: ASTM D714- Paint Blistering Test, ASTM D4585 – Humidity Test, ASTM B117 – Salt Spray (Fog) Test, ASTM D1654 – Painted Products in Corrosive Environments, ASTM G85 – Cyclic Fog/Dry Test (Prohesion), ASTM D5894 – Salt Fog/UV Painted Metal, ASTM D4541 – Pull Off Strength of Coating Test.
10. Along with submittals, the window manufacturer shall provide the applicable test report from a qualified independent testing laboratory regularly engaged in testing windows to verify that his products conform to these test requirements. All testing must be current and meet minimum requirements in conformance with specifications

1.3 SUBMITTALS

A. Samples (as requested by architect):
1. Typical corner sample.
2. Color sample of finish.

B. Shop drawings and manufacturer's literature:
1. Submit for approval shop drawings showing full size window and installation details including anchorage, fastening and recommended sealing methods.
2. Dimensioned elevations showing window opening and window sizes.
3. The manufacturer shall not commence any work until shop drawings have been approved.
4. Color charts for standard finishes and sealants.

1.4 PRODUCTS, STORAGE AND HANDLING

A. The general contractor shall be responsible for the protection and storage of the windows after delivery to the site.

B. Store in designated areas as close as possible to point of installation.

1.5 WARRANTY

A. Provided Hope's standard (1) year Warranty.

1. PART 2 - PRODUCT

2.1 MATERIALS

A. The perimeter interior framing shall be formed from 12-gauge steel.

B. The perimeter exterior framing shall be Hope's aluminum thermal break sections extruded from alloy 6063-T52 with a minimum wall thickness of .125". The screws attaching the exterior and interior perimeter framing shall be stainless steel.

C. Horizontal rail bars to receive and conceal steel detention bars without dividing the glass area. Rail bars shall be from 12-gauge steel.

D. Thermal break in the exterior aluminum frame shall be poured in thermal break material.

E. Glazing rebate shall provide unobstructed glazing surface at least 3/4" in height.

F. Maximum detention windows shall have detention bars of 7/8" or 1" round and 1/4" x 2 ½" flat tool-resisting steel conforming to ASTM specifications A627. (Moderate detention windows shall have detention bars of 7/8" or 1" round and 1/4" x 2 ½" flat mild steel.)

G. Glazing beads shall be aluminum, extruded from alloy 6063-T52 with a minimum wall thickness of .062". Attaching screw shall be tamper-resistant stainless steel.

H. Anchors shall be fabricated from steel angles with a minimum leg thickness of 3/16". (For pre-cast applications anchors shall be 3/8" diameter concrete anchor studs.)

I. Screws shall be tamper-resistant truss-head plated steel.

J. Painted Finish (Steel):
1. Pre-treatment.
2. Primer – E-Coat (Electrodeposited epoxy primer).
3. Finish coat – Factory applied polyurethane

K. Finish (Aluminum):
1. 204R1 Clear or Bronze Anodize.

2.2 FABRICATION

A. Fabricate windows in accordance with approved shop drawings.

B. The perimeter framing shall consist of two units, exterior and interior sub-frames. The interior sub-frame shall be coped and welded at corners the full depth of the frame for maximum strength and weather tightness, with all exposed welds dressed smooth. The corners of the exterior sub-frame shall be coped and screwed.

C. Horizontal imposts shall be securely welded to the frame for maximum strength and weather tightness, with all welds dressed smooth or concealed.

D. The interior sub-frame shall be equipped with threaded AVK nuts to which the exterior sub frame shall be securely attached. Drilled holes with pop rivet attachment shall not be acceptable.

E. Anchors shall be located a maximum of 18" on center and shall be a minimum of 2" long.

F. All removable covers or trim, either exterior or interior, shall be attached with tamper-resistant screws spaced not more than 9" on center at the interior and spaced not more than 12" on center at the exterior.

G. Horizontal or vertical 7/8" or 1" round steel detention bars shall penetrate and be securely welded to the concealed 1/4" x 2 ½" flat detention bars to form an integral detention grid. The 7/8" or 1" round detention bars shall be equipped with a feature that allows the rod to rotate freely and discourages a device from cutting into the bar.

H. Where the height or width of a window requires, intermediate detention bars may be added that would allow the horizontal or vertical 7/8" or 1" round steel detention bars to penetrate and run continuously. This intermediate bar would prevent any deflection or spreading of the horizontal or vertical detention bars. For maximum detention, this intermediate bar shall be 1/4" x 2 ½" flat tool-resistant steel bar (1/4" x 2 ½" flat mild steel for moderate detention) concealed in a 12-gauge steel formed impost. The recommended width or height without an intermediate bar should not exceed 36". (Consult Hope's.)

I. Glazing:
1. All frames shall be designed for outside glazing.
2. Provide continuous glazing beads to suit glass, security glass, as specified.
3. Glazing beads shall be attached with tamper-resistant screws spaced a maximum of 9" on center.

J. Factory finishing (Steel):
1. E-Coat Prime Painting
   a. Following the pretreatment, windows and accessories are e-coated with a cathodic epoxy primer of PPG Powercron® 8000 or equivalent to insure all surfaces are evenly covered. Spray or dip primers shall not be acceptable.
   b. Immersed in a rinse of ultra-filtered RO water for 3 min to remove all the excess paint and removing any runs.
   c. A spray of ultra-filtered RO water repeats the above process to further improve surface conditions.
   d. The primer is oven baked to 335 degrees F for 15 minutes to a dry film thickness of 0.7 - 1.0 mil.
   e. The material is then cooled in preparation for the finish coat.
2. Ultrathane Finish Painting
   a. Following the prime coat, all windows and accessories are given a spray coat of acrylic polyurethane and oven baked at 225 degrees F for 15 minutes to dry film thickness of 1.5 to 2.0 mils.
   b. The combined overall dry film thickness of the prime coat and finish coat shall be 2.2 - 3.0 mils.
   c. The architect shall choose from an unlimited color selection. Color matching is available upon request, along with clear coats. Some colors may require clear coats for added protection. Consult your Hope's Representative for selection assistance.
3. E-Coat/top coat combination shall provide full documented compliance with all ASTM designations as outlined in Quality Assurance portion of the specifications.

2. PART 3 - EXECUTION

3.1 INSPECTION

A. Window openings shall conform to details, dimensions and tolerances shown on the window manufacturer's approved shop drawings.

B. The general contractor must correct conditions, which may adversely affect the window installation, before installation commences.

3.2 INSTALLATION

A. Experienced personnel shall install Windows specified under this section.

B. Install windows in openings in strict accordance with approved shop drawings.
1. Set windows plumb, level and true to line without warp or rack of frames.
2. Anchor windows securely to surrounding construction with minimum of 1” long welds at anchor points. Maximum distance between weld points will be 18”.
3. The exterior joints between the windows, trim and mullions shall be properly sealed weather tight with an approved sealant and neatly pointed.

C. Install detention screens (if specified).

D. Repair any abraded areas of the factory finish.

3.3 CLEANING

A. Window installer shall leave the window surfaces clean after installation and ready to receive glass and glazing. The window installer shall not be responsible for final cleaning.

B. Any protection necessary due to cleaning adjacent materials shall be the responsibility of the general contractor.

SECTION 08 6200
UNIT SKYLIGHTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Skylights with integral frame.

B. Integral insulated curb.

1.02 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2017.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

G. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2019c.

H. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Include structural, thermal, and daylighting performance values.

C. Shop Drawings: Indicate configurations, dimensions, locations, fastening methods, and installation details.

D. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.
   3. Evidence of CSA Certification.
   4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not less than three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide five-year manufacturer warranty including coverage for leakage due to defective skylight materials or construction. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Unit Skylights:
   1. Kingspan Light + Air, LLC; Tufflite HVHZ Aluminum Framed Polycarbonate Dome Skylight: www.kingspanlightand air.us/#sle.
   2. Velux America, Inc: www.veluxusa.com/#sle.
   3. Wasco Skylights - Part of the VELUX Group: www.wascoskylights.com/#sle.

2.02 SKYLIGHTS

A. Skylights: Factory-assembled glazing in aluminum frame, free of visual distortion, and weathertight.
   1. Shape: Square dome.
   2. Glazing: Double.
   3. Operation: None; fixed.
   4. Roof Slope: Flat.
   5. Nominal Size: As indicated on drawings.

2.03 PERFORMANCE REQUIREMENTS

A. Provide unit skylights that comply with the following:
   1. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific skylight type:
   2. Allow for expansion and contraction within system components caused by a cycling surface temperature range of 170 degrees F without causing detrimental effects to system or components.
   3. Energy Code Compliance: Comply with ICC (IBC), ASHRAE Std 90.1 I-P, or the authorities having jurisdiction as required for unit skylights.

2.04 DESIGN CRITERIA

A. Unit Skylight Design: Design and size components to withstand dead loads and live loads caused by snow, hail, and positive and negative wind loads acting on skylight unit without damage or permanent set.
   1. Regulatory Requirements: Comply with applicable code criteria for loads, including seismic loads.
   2. Design Loads: As indicated on drawings.

2.05 COMPONENTS

A. Double Glazing: Polycarbonate plastic; factory sealed.
   1. Outer Glazing: White translucent.
   2. Inner Glazing: Clear transparent.
   3. Thermal Transmittance (U-Value): 0.50, nominal.

B. Frames: ASTM B221 (ASTM B221M) Extruded aluminum thermally broken, reinforced and welded corner joints, integral curb frame mounting flange and counterflashing to receive roofing flashing system, with integral condensation collection gutter, glazing retainer; clear anodized finish.

C. Support Curbs: Sheet aluminum ASTM B209/B209M, sandwich construction; 1 inch wide, 12 inches high; rigid foam insulation; with integral flange for anchorage to roof deck.

2.06 ACCESSORIES

A. Anchorage Devices: Type recommended by manufacturer, exposed to view.

B. Counterflashings: Same metal type and finish as skylight frame.

C. Protective Back Coating: Zinc molybdate alkyd.

D. Sealant: Elastomeric, silicone or polyurethane, compatible with material being sealed .

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that openings and substrate conditions are ready to receive work of this section.

3.02 PREPARATION

A. Apply protective back coating on aluminum surfaces of skylight units that will be in contact with cementitious materials or dissimilar metals.

3.03 INSTALLATION

A. Install unit skylights in accordance with manufacturer's instructions and ASTM E2112.

B. Install aluminum curb assembly, fastening securely to roof decking; flash curb assembly into roofing system.

C. Install skylight units and mount securely to curb assembly; install counterflashing as required.

D. Apply sealant to achieve watertight assembly.

3.04 CLEANING

A. Remove protective material from prefinished aluminum surfaces.

B. Wash down exposed surfaces; wipe surfaces clean.

C. Remove excess sealant.

END OF SECTION

SECTION 08 7100

DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY

A. Description of Work:
   1. The work under this section shall consist of furnishing all labor, materials, equipment, and appliances necessary or required to perform and complete all Detention Door Hardware work as shown on the drawings, as specified herein, or required by conditions at the site. Detention Hardware shall be furnished to complete the building project and shall meet all requirements of building, fire, safety, and all other codes as applicable.
   2. The hardware supplier shall coordinate hardware with related trades such as metal doors, frames, etc.
   3. Refer to the Door/Openings Schedule for the door schedule relating to this Work.

1.02 SECTION INCLUDES

A. Hardware for hollow metal doors.

B. Hardware for fire-rated doors.

C. Electrically operated and controlled hardware.

D. Thresholds.

E. Weatherstripping and gasketing.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. BHMA (CPD) - Certified Products Directory; Current Edition.

C. BHMA A156.1 - Standard for Butts and Hinges; 2021.

D. BHMA A156.3 - Exit Devices; 2020.

E. BHMA A156.4 - Door Controls - Closers; 2019.

F. BHMA A156.5 - Cylinders and Input Devices for Locks; 2020.

G. BHMA A156.6 - Standard for Architectural Door Trim; 2021.

H. BHMA A156.7 - Template Hinge Dimensions; 2016.

I. BHMA A156.8 - Door Controls - Overhead Stops and Holders; 2021.

J. BHMA A156.13 - Mortise Locks & Latches Series 1000; 2017.

K. BHMA A156.15 - Release Devices - Closer Holder, Electromagnetic and Electromechanical; 2021.

L. BHMA A156.16 - Auxiliary Hardware; 2018.

M. BHMA A156.21 - Thresholds; 2019.

N. BHMA A156.22 - Standard for Gasketing; 2021.

O. BHMA A156.25 - Electrified Locking Devices; 2018.

P. BHMA A156.26 - Standard for Continuous Hinges; 2021.

Q. BHMA A156.30 - High Security Cylinders; 2020.

R. BHMA A156.31 - Electric Strikes and Frame Mounted Actuators; 2019.

S. BHMA A156.115 - Hardware Preparation In Steel Doors And Steel Frames; 2016.

T. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.

U. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.

V. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

W. ITS (DIR) - Directory of Listed Products; current edition.

X. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Y. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

Z. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

AA. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

AB. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

AC. UL (DIR) - Online Certifications Directory; Current Edition.

AD. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

AE. UL 437 - Standard for Key Locks; Current Edition, Including All Revisions.

AF. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:
   1. Architect.
   2. Installer's Architectural Hardware Consultant (AHC).
   3. Hardware Installer.
   4. Owner's Security Consultant.

D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

E. Keying Requirements Meeting:
   1. Schedule meeting at project site prior to Contractor occupancy.
   2. Attendance Required:
      a. Contractor.
      b. Owner.
      c. Architect.
      d. Hardware Installer.
      e. Owner's Security Consultant.
      f. Security Electronics Contractor.
   3. Agenda:
      a. Establish keying requirements.
      b. Verify locksets and locking hardware are functionally correct for project requirements.
      c. Verify that keying and programming complies with project requirements.
      d. Establish keying submittal schedule and update requirements.
   4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
      a. Access control requirements.
      b. Key control system requirements.
      c. Schematic diagram of preliminary key system.
      d. Flow of traffic and extent of security required.
   5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
   6. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
   3. List groups and suffixes in proper sequence.
   4. Provide complete description for each door listed.
   5. Provide manufacturer name, product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
   6. Include account of abbreviations and symbols used in schedule.

D. Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
   2. Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
   3. Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.

E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
   1. Submit manufacturer's parts lists and templates.
   2. Bitting List: List of combinations as furnished.

F. Keying Schedule:
   1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

G. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

H. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Lock Cylinders: Ten for each master keyed group.
   3. Locksets: Two for each type specified.
   4. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.06 QUALITY ASSURANCE

A. The detention hardware supplier shall have past experience in detention hardware and have in their employ, a specialist in detailing detention hardware for detention doors and frames.

B. Immediately after the award of the detention hardware contract, it shall be the responsibility of the detention hardware supplier to request approved shop drawings from such trades with which hardware must be coordinated.

C. All items of hardware shall be delivered to the job site in the manufacturer’s original package. Each item shall be clearly marked with the proper opening number so that installer can clearly identify the proper location.

D. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

E. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

F. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

G. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
   2. Accessibility: ADA Standards and ICC A117.1.
   3. Applicable provisions of NFPA 101.
   4. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
   5. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
   6. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide door hardware that complies with local codes, and requirements of assemblies tested in accordance with UL 1784.
      a. Air Leakage Rate: Tested in accordance with UL 1784, with air leakage rate not to exceed 3.0 cfm/sf of door opening at 0.10 inch of water for both ambient and elevated temperature tests.
   7. Listed and certified compliant with specified standards by BHMA (CPD).
   8. Auxiliary Hardware: BHMA A156.16.
   9. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
   10. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

D. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.
   1. See Section 28 1000 for additional access control system requirements.

E. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. See Section 08 0671 for listing of hardware sets.
   1. Provide Fail Secure operation.

F. Fasteners:
   1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications. Finish exposed fasteners to match item

fastened. Provide fasteners of the same metal as item fastened, except use stainless steel for aluminum items.
   a. Aluminum fasteners are not permitted.
   b. Provide tamper resistant Torx security screws unless otherwise indicated.
2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
   a. Self-drilling (Tek) type screws are not permitted.
3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
4. Provide spacers or sex bolts with sleeves for through bolting of hollow metal doors and frames.
5. Fire-Rated Applications: Comply with NFPA 80.
   a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
   b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.
6. Concealed Fasteners: Do not use through or sex bolt type fasteners on door panel sides indicated as concealed fastener locations, unless otherwise indicated.

2.02 HINGES

A. Manufacturers:
   1. McKinney; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Hager Companies: www.hagerco.com/#sle.
   3. Stanley, dormakaba Group: www.stanleyhardwarefordoors.com/#sle.
   4. Ives, an Allegion brand: www.allegion.com.us.

B. Hinges: Comply with BHMA A156.1, Grade 1.
   1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
      a. Provide hinge width required to clear surrounding trim.
   2. Continuous Hinges: Comply with BHMA A156.26.
   3. Provide hinges on every swinging door.
   4. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
   5. Provide ball-bearing hinges at each door.
   6. Provide non-removable pins on outswinging doors.
   7. Provide power transfer hinges where electrified hardware is mounted in door leaf.
   8. Provide following quantity of butt hinges for each door:
      a. Doors From 60 inches High up to 90 inches High: Three hinges.

2.03 EXIT DEVICES

A. Manufacturers:
   1. Sargent; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Precision, dormakaba Group: www.precisionhardware.com/#sle.
   3. Von Duprin, an Allegion brand: www.allegion.com/us/#sle.

B. Exit Devices: Comply with BHMA A156.3, Grade 1.
   1. Lever design to match lockset trim.
   2. Provide cylinder with cylinder dogging or locking trim.
   3. Provide exit devices properly sized for door width and height.
   4. Provide strike as recommended by manufacturer for application indicated.
   5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.
   6. Provide Fail Secure mode.
   7. For electrical options, provide quick connect plug-in pre-wired connectors.

2.04 ELECTRIC STRIKES

A. Electric Strikes: Comply with BHMA A156.31, Grade 1.
   1. Provide UL (DIR) listed burglary-resistant electric strike; style to suit locks.

2. Provide non-handed 24 VDC electric strike suitable for door frame material and scheduled lock configuration.
3. Provide field selectable Fail Safe/Fail Secure modes.
4. Provide transformer and rectifier as necessary for complete installation.
5. Connect electric strikes into fire alarm where non-rated doors are scheduled to release with fire or sprinkler alarm condition.

2.05 LOCK CYLINDERS

A. Manufacturers:
1. Best, dormakaba Group: www.bestaccess.com/#sle. To match existing building keying system.

B. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
1. Provide small format interchangeable core (SFIC) type cylinders, Grade 1, with seven-pin core in compliance with BHMA A156.5 at locations indicated.
2. Provide high security mechanical type cylinders, Grade 1, with seven-pin core in compliance with BHMA A156.30 or UL 437 at locations indicated.
3. Provide cylinders from same manufacturer as locking device.
4. Provide cams and/or tailpieces as required for locking devices.
5. Within specific Door Sections, when provisions for lock cylinder are being referenced to this Section, provide specified lock cylinder and keyed to building keying system, unless otherwise indicated.

2.06 MORTISE LOCKS

A. Manufacturers:
1. Best, dormakaba Group: www.bestaccess.com/#sle.
2. Schlage, an Allegion brand: www.allegion.com/us/#sle.

B. Mortise Locks: Comply with BHMA A156.13, Grade 1, Security, 1000 Series.
1. Latchbolt Throw: 3/4 inch, minimum.
2. Deadbolt Throw: 1 inch, minimum.
3. Backset: 2-3/4 inch unless otherwise indicated.
4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
a. Finish: To match lock or latch.

2.07 ELECTROMECHANICAL LOCKS

A. Manufacturers:
1. Best, dormakaba Group; _____: www.bestaccess.com/#sle.
2. Schlage, an Allegion brand; _____: www.allegion.com/us/#sle.

B. Electromechanical Locks: Comply with BHMA A156.25, Grade 1.
1. Provide motor-driven or solenoid-driven locks, with strike that is applicable to frame.
2. Type: Mortise deadbolt.

2.08 CLOSERS

A. Manufacturers; Surface Mounted:
1. Norton; an Assa Abloy Group company; 7700: www.assaabloydss.com/#sle.
2. LCN, an Allegion brand; 4040XP: www.allegion.com/us/#sle.

B. Closers: Comply with BHMA A156.4, Grade 1.
1. Type: Surface mounted to door.
2. Provide door closer on each exterior door.
3. Provide door closer on each fire-rated and smoke-rated door.
a. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.
4. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.
5. At corridor entry doors, mount closer on room side of door.
6. At outswinging exterior doors, mount closer on interior side of door.

2.09 OVERHEAD STOPS AND HOLDERS

A. Manufacturers:
   1. Rixson; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Glynn-Johnson, an Allegion brand: www.allegion.com/us/#sle.

B. Overhead Stops and Holders (Door Checks): Comply with BHMA A156.8, Grade 1.
   1. Provide stop for every swinging door, unless otherwise indicated.
   2. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop, unless otherwise indicated.

2.10 PROTECTION PLATES

A. Protection Plates: Comply with BHMA A156.6.
   1. Metal Properties: Stainless steel.
      a. Metal, Extra Heavy Duty - Flat Plate: Thickness 1/8 inch, minimum, with smooth plate surface.
   2. Edges: Beveled, on four sides unless otherwise indicated.
   3. Fasteners: Countersunk screw fasteners.
   4. Drip Guard: Provide at head of exterior doors unless covered by roof or canopy.

B. ARMOR PLATES
   1. Armor Plates: Provide on bottom half of push side of doors that require protection from objects moving through openings that may damage door surface.
      a. Size: 16 inch high by 1-1/2 inch less door width (LDW) on pull side and 2 inch LDW on push side of door.

C. KICK PLATES
   1. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
      a. Size: 8 inch high by 2 inch less door width (LDW) on push side of door.

2.11 DOOR HOLDERS

A. Manufacturers:

B. Door Holders: Comply with BHMA A156.16, Grade 1.
   1. Provide surface mounted door holders when wall or floor stop is not applicable and hold-open device is mounted on door.
   2. Type: Lever, or kick down stop, with rubber bumper at bottom end.
   3. Material: Aluminum.

2.12 ELECTROMAGNETIC DOOR HOLDERS

A. Manufacturers:
   1. DORMA USA, Inc; EM Series: www.dorma.com/#sle.

B. Electromagnetic Door Holders: Comply with BHMA A156.15.
   1. Type: Wall mounted, single unit, heavy duty, with strike plate attached to door.
   2. Holding Force, Heavy Duty: 300 lbs-force, minimum.
   3. Voltage: 24 VDC, and provide power supplies by same manufacturer as holders.
   4. Fail safe; door released to close automatically when electrical current is interrupted.
   5. Provide interface with fire detectors and fire-alarm system for fire-rated door assemblies.

2.13 WALL STOPS

A. Manufacturers:
   1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Hager Companies: www.hagerco.com/#sle.
   3. Ives, an Allegion brand: www.us.allegion.com.

B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
   1. Provide wall stops to prevent damage to wall surface upon opening door.

2. Type: Bumper, concave, wall stop.
3. Material: Aluminum housing with rubber insert.

2.14 ASTRAGALS

A. Astragals: Comply with BHMA A156.22.
1. Provide surface mounted astragal to cover or fill space for full door height between pair of doors or door and adjacent jamb.
2. Type: Security, and with sealing gasket.
3. Material: Aluminum, with neoprene weatherstripping.
4. Provide non-corroding fasteners at exterior locations.

2.15 THRESHOLDS

A. Manufacturers:
1. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. National Guard Products, Inc: www.ngpinc.com/#sle.
3. Reese Enterprises, Inc: www.reeseusa.com/#sle.
4. Zero International, Inc: www.zerointernational.com/#sle.

B. Thresholds: Comply with BHMA A156.21.
1. Provide threshold at each exterior door, unless otherwise indicated.
2. Type: Flat surface.
3. Material: Aluminum.
4. Threshold Surface: Thermally broken.
5. Field cut threshold to profile of frame and width of door sill for tight fit.
6. Provide non-corroding fasteners at exterior locations.

2.16 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
1. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. National Guard Products, Inc: www.ngpinc.com/#sle.
3. Reese Enterprises, Inc: www.reeseusa.com/#sle.
4. Zero International, Inc: www.zerointernational.com/#sle.

B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
1. Head and Jamb Type: Adjustable.
2. Door Sweep Type: Encased in retainer.
3. Material: Aluminum, with brush weatherstripping.
4. Provide gasketing for smoke and draft control doors (Indicated as "S" on Drawings) that complies with local codes, requirements of assemblies tested in accordance with UL 1784.
5. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
6. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.17 COAT HOOKS

A. Coat Hooks: Provide on room side of door, screw fastened.

B. Material: Stainless steel.

2.18 SILENCERS

A. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
1. Single Door: Provide three on strike jamb of frame.
2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
3. Material: Rubber, gray color.

2.19 FIRE DEPARTMENT LOCK BOX

A. Manufacturers:
1. Knox Company; Knox-Box Rapid Entry System: www.knoxbox.com/#sle.

2. Substitutions: See Section 01 6000 - Product Requirements.

B. Fire Department Lock Box:
   1. Heavy-duty, surface mounted, solid stainless-steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers and tamper alarm.
   2. Capacity: Holds 10 keys.
   3. Finish: Manufacturer's standard dark bronze.

2.20 POWER SUPPLY

A. Power Supply: Hard wired, with multiple zones providing eight (8) breakers for each output panel with individual control switches and LED's; UL (DIR) Class 2 listed.
   1. Coordinate power requirements with electrifed hardware.
   2. Operating Temperature: 32 to 110 degrees F.
   3. Provide with emergency release terminals that release devices upon activation of fire alarm system.

2.21 FINISHES

A. Finishes: Identified in Section 08 0671 - Door Hardware Schedule.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. Install hardware for smoke and draft control doors in accordance with NFPA 105.

D. Use templates provided by hardware item manufacturer.

E. Do not install surface mounted items until application of finishes to substrate are fully completed.

F. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
   1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
   2. Mounting heights in compliance with ADA Standards:
      a. Locksets: 40-5/16 inch.
      b. Deadlocks (Deadbolts): 48 inch.
      c. Exit Devices: 40-5/16 inch.

G. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 01 4000 - Quality Requirements.

3.04 ADJUSTING

A. Adjust work under provisions of Section 01 7000 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.06 PROTECTION

A. Protect finished Work under provisions of Section 01 7000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

SECTION 08 7101
DOOR HARDWARE SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule of door hardware sets for swinging as indicated on drawings.

1.02 REFERENCE STANDARDS

A. BHMA (CPD) - Certified Products Directory; Current Edition.

B. BHMA A156.3 - Exit Devices; 2020.

C. BHMA A156.5 - Cylinders and Input Devices for Locks; 2020.

D. BHMA A156.13 - Mortise Locks & Latches Series 1000; 2017.

E. BHMA A156.18 - Materials and Finishes; 2020.

F. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.

1.03 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data & Samples for submittal procedures.

B. Comply with submittal requirements as indicated in Section 08 7100.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Only manufacturers listed in Door Hardware Schedule or Section 08 7100 are considered acceptable, unless noted otherwise.

B. Obtain each type of door hardware as indicated from a single manufacturer and single supplier.

C. Products are listed and certified compliant with specified standards by BHMA (CPD).

D. Manufacturer's Abbreviations: Coordinate with manufacturers listed in Section 08 7100.
   1. AR - Adams Rite.
   2. BAS - Best Access Systems.
   3. CR - Corbin Russwin.
   4. CUR - Curries.
   5. DMA - Dorma.
   6. GJ - Glynn Johnson.
   7. HGR - Hager.
   8. IVE - Ives.
   9. HOR - Horton Automatics.
   10. KAW - Kawneer.
   11. LCN - LCN.
   12. McK - McKinney.
   13. NGP - National Guard Products.
   14. NOR - Norton.
   15. PEM - Pemko.
   16. PH - Precision Hardware.
   17. RIX - Rixson.
   18. ROC - Rockwood.
   19. SA - Sargent.
   20. SCH - Schlage.
   21. SEC - Securitron.
   22. SH - Stanley Hinges.
   23. STH - Stanley Commercial Hardware.
   24. STL - Steelcraft.
   25. TR - Trimco.
   26. VD - Von Duprin.

27. WIK - Wikk.
28. YA - Yale.
29. ZRO - Zero Industries, Inc.

2.02 DESCRIPTION

A. Door hardware sets provided represent the design intent, they are only a guideline and should not be considered a detailed or complete hardware schedule.
   1. Provide door hardware item(s) as required for similar purposes, even when item is not listed for a door in Door Hardware Schedule.
   2. Necessary items that are not included in a Hardware Set should be added and have the appropriate additional hardware as required for proper application and functionality.
   3. Door hardware supplier is responsible for providing proper size and hand of door for products required in accordance with Door Hardware Schedule and as indicated on drawings.
   4. Quantities listed are for each Pair (PR) of doors, or for each Single (SGL) door, as indicated in hardware sets.

2.03 LOCK FUNCTION CODES

A. Function Codes for Mortise Locks: Complying with BHMA A156.13.

B. Function Codes for Exit Devices: Complying with BHMA A156.3.

2.04 FINISHES

A. Finishes: Complying with BHMA A156.18.
   1. Code 626: Satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D).
   2. Code 630: Satin stainless steel, with stainless steel 300 series base material (former US equivalent US32D).
   3. Code 689: Aluminum painted, with any base material (former US equivalent US28).

PART 3 EXECUTION

3.01 DOOR HARDWARE SCHEDULE

A. Organize listing of door hardware components within each hardware set in compliance with 10-Part scheduling sequence indicated in DHI (H&S), unless otherwise indicated.

B. Provide and install hardware conforming to project specifications in sets according to the schedule below. Products listed are representative of acceptable manufacturers; refer to Section 08 7100 for other acceptable manufacturers.

3.02 HARDWARE SET # 01: "INTERIOR - POD VESTIBULE PASSAGE"

A. Template Closer to swing 180 degrees where possible.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 EA		HW HINGE	5BB1HW 4.5 x 4.5	626	IVE
1 EA	F01	PASSAGE LATCHSET	45H N __ L9010 SL1	626	BAS SCH
1 EA		DOOR POSITION SWITCH	679-05HM		SCH
1 EA		SURFACE CLOSER	4040XP EDA	689	LCN
1 EA		ARMOR PLATE	8400-B4E-CS 48 X 2 INCH LDW	630	IVE
1 EA		WALL STOP	WS	626	IVE
3 EA		SILENCER	SR64	GRY	IVE
1 EA		KICK DOWN STOP	FS452	626	IVE

C. OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LATCHED. INSIDE LEVER ALWAYS FREE FOR EGRESS. 180 DEGREE OPEN. LIGATURE RESISTANT.

3.03 HARDWARE SET # 02A: "INTERIOR - ELECTRIFIED LOCK"

A. Template Closer to swing 180 degrees where possible.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 EA		ELECTRIFIED HINGE	5BB1HW 4.5 x 4.5 CON	626	IVE
1 EA		ELECTRIFIED LOCK	45HW DEU __ RQE LS DS L9092EU SL1 RX LX DPS	626	BAS SCH
1 EA		CYLINDER			
1 EA		DOOR POSITION SWITCH	679-05HM		SCH
1 EA		CARD READER			
1 EA		SURFACE CLOSER	4040XP EDA	689	LCN
1 EA		KICK PLATE	8400-B4E-CS 10 X 2 INCH LDW	630	IVE
1 EA		WALL STOP	WS	626	IVE
3 EA		SILENCER	SR64	GRY	IVE
1 EA		COAT HOOK	RM828	US32D	ROC
1 EA		POWER SUPPLY	PS902 900-2RS		VD

C. OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL OR KEY OVERRIDE ALLOWS ENTRY. DOOR REMAINS LOCKED UPON LOSS OF POWER. INSIDE LEVER ALWAYS FREE FOR EGRESS. LIGATURE RESISTANT.

3.04 HARDWARE SET # 02B: "INTERIOR - ELECTRIFIED LOCK-OH"

A. Template Closer to swing 180 degrees where possible.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 EA		ELECTRIFIED HINGE	5BB1HW 4.5 x 4.5 CON	626	IVE
1 EA		ELECTRIFIED LOCK	45HW DEU __ RQE LS DS L9092EU SL1 RX LX DPS	626	BAS SCH
1 EA		CYLINDER			
1 EA		DOOR POSITION SWITCH	679-05HM		SCH
1 EA		CARD READER			
1 EA		SURFACE CLOSER	4040XP EDA	689	LCN
1 EA		KICK PLATE	8400-B4E-CS 10 X 2 INCH LDW	630	IVE
1 EA		OVERHEAD STOP	100S	US32D	GJ
3 EA		SILENCER	SR64	GRY	IVE
1 EA		COAT HOOK	RM828	US32D	ROC
1 EA		POWER SUPPLY	PS902 900-2RS		VD

C. OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL OR KEY OVERRIDE ALLOWS ENTRY. DOOR REMAINS LOCKED UPON LOSS OF POWER. INSIDE LEVER ALWAYS FREE FOR EGRESS. LIGATURE RESISTANT.

3.05 HARDWARE SET # 02C: "INTERIOR - ELECTRIFIED LOCK-SMOKE"

A. Template Closer to swing 180 degrees where possible.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 EA		ELECTRIFIED HINGE	5BB1HW 4.5 x 4.5 CON	626	IVE
1 EA		ELECTRIFIED LOCK	45HW DEU __ RQE LS DS L9092EU SL1 RX LX DPS	626	BAS SCH
1 EA		CYLINDER			
1 EA		DOOR POSITION SWITCH	679-05HM		SCH
1 EA		CARD READER			
1 EA		SURFACE CLOSER	4040XP EDA	689	LCN
1 EA		KICK PLATE	8400-B4E-CS 10 X 2 INCH LDW	630	IVE
1 EA		WALL STOP	WS	626	IVE
		SMOKE SEAL	188S ZAG	BK	ZRO
3 EA		SILENCER	SR64	GRY	IVE
1 EA		COAT HOOK	RM828	US32D	ROC
1 EA		POWER SUPPLY	PS902 900-2RS		VD

C. OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL OR KEY OVERRIDE ALLOWS ENTRY. DOOR REMAINS LOCKED UPON LOSS OF POWER. INSIDE LEVER ALWAYS FREE FOR EGRESS. LIGATURE RESISTANT.

3.06 HARDWARE SET # 02D: "INTERIOR - ELECTRIFIED LOCK-SMOKE-OH"

A. Template Closer to swing 180 degrees where possible.

B. For use on Door Number(s): 123.

C. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 EA		ELECTRIFIED HINGE	5BB1HW 4.5 x 4.5 CON	626	IVE
1 EA		ELECTRIFIED LOCK	45HW DEU __ RQE LS DS L9092EU SL1 RX LX DPS	626	BAS SCH
1 EA		CYLINDER			
1 EA		DOOR POSITION SWITCH	679-05HM		SCH
1 EA		CARD READER			
1 EA		SURFACE CLOSER	4040XP EDA	689	LCN
1 EA		KICK PLATE	8400-B4E-CS 10 X 2 INCH LDW	630	IVE
1 EA		OVERHEAD STOP	100S	US32D	GJ
		SMOKE SEAL	188S ZAG	BK	ZRO
3 EA		SILENCER	SR64	GRY	IVE
1 EA		COAT HOOK	RM828	US32D	ROC
1 EA		POWER SUPPLY	PS902 900-2RS		VD

D. OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL OR KEY OVERRIDE ALLOWS ENTRY. DOOR REMAINS LOCKED UPON LOSS OF POWER. INSIDE LEVER ALWAYS FREE FOR EGRESS. LIGATURE RESISTANT.

3.07 HARDWARE SET # 03A: "INTERIOR - ELECTRIFIED LOCK"

A. Template Closer to swing 180 degrees where possible.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 EA		ELECTRIFIED HINGE	5BB1HW 4.5 X 4.5 CON	652	IVE
1 EA		ELECTRIFIED LOCK	45HW DEU __ RQE LS DS L9092EU SL1 RX LX DPS	626	BAS SCH
1 EA		CYLINDER			
1 EA		DOOR POSITION SWITCH	679-05HM		SCH
1 EA		SURFACE CLOSER	4040XP EDA	689	LCN
1 EA		WALL STOP	WS	626	IVE
1 EA		KICK PLATE	8400-B4E-CS 10 X 2 INCH LDW	630	IVE
3 EA		SILENCER	SR64	GRY	IVE

C. OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL OR KEY OVERRIDE ALLOWS ENTRY. DOOR REMAINS LOCKED UPON LOSS OF POWER. INSIDE LEVER ALWAYS FREE FOR EGRESS. LIGATURE RESISTANT

3.08 HARDWARE SET # 03B: "INTERIOR - ELECTRIFIED LOCK-OH"

A. Template Closer to swing 180 degrees where possible.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 EA		ELECTRIFIED HINGE	5BB1HW 4.5 X 4.5 CON	652	IVE
1 EA		ELECTRIFIED LOCK	45HW DEU __ RQE LS DS L9092 SL1 RX LX DPS	626	BAS SCH
1 EA		CYLINDER			
1 EA		DOOR POSITION SWITCH	679-05HM		SCH
1 EA		SURFACE CLOSER	4040XP EDA	689	LCN
1 EA		OVERHEAD STOP	100S	US32D	GJ
1 EA		KICK PLATE	8400-B4E-CS 10 X 2 INCH LDW	630	IVE
3 EA		SILENCER	SR64	GRY	IVE

C. OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL OR KEY OVERRIDE ALLOWS ENTRY. DOOR REMAINS LOCKED UPON LOSS OF POWER. INSIDE LEVER ALWAYS FREE FOR EGRESS. LIGATURE RESISTANT

3.09 HARDWARE SET # 03C: "INTERIOR - ELECTRIFIED LOCK-SMOKE"

A. Template Closer to swing 180 degrees where possible.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 EA		ELECTRIFIED HINGE	5BB1HW 4.5 X 4.5 CON	652	IVE
1 EA		ELECTRIFIED LOCK	45HW DEU __ RQE LS DS L9092EU SL1 RX LX DPS	626	BAS SCH
1 EA		CYLINDER			
1 EA		DOOR POSITION SWITCH	679-05HM		SCH
1 EA		SURFACE CLOSER	4040XP EDA	689	LCN
1 EA		WALL STOP	WS	626	IVE
1 EA		KICK PLATE	8400-B4E-CS 10 X 2 INCH LDW	630	IVE
		SMOKE SEAL	188FS ZAG	BK	ZRO
3 EA		SILENCER	SR64	GRY	IVE

C. OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL OR KEY OVERRIDE ALLOWS ENTRY. DOOR REMAINS LOCKED UPON LOSS OF POWER. INSIDE LEVER ALWAYS FREE FOR EGRESS. LIGATURE RESISTANT

3.10 HARDWARE SET # 03D: "INTERIOR - ELECTRIFIED LOCK-SMOKE-OH"

A. Template Closer to swing 180 degrees where possible.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 EA		ELECTRIFIED HINGE	5BB1HW 4.5 X 4.5 CON	652	IVE
1 EA		ELECTRIFIED LOCK	45HW DEU __ RQE LS DS L9092 SL1 RX LX DPS	626	BAS SCH
1 EA		CYLINDER			
1 EA		DOOR POSITION SWITCH	679-05HM		SCH
1 EA		SURFACE CLOSER	4040XP EDA	689	LCN
1 EA		OVERHEAD STOP	100S	US32D	GJ
1 EA		KICK PLATE	8400-B4E-CS 10 X 2 INCH LDW	630	IVE
		SMOKE SEAL	188FS ZAG	BK	ZRO
3 EA		SILENCER	SR64	GRY	IVE

C. OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL OR KEY OVERRIDE ALLOWS ENTRY. DOOR REMAINS LOCKED UPON LOSS OF POWER. INSIDE LEVER ALWAYS FREE FOR EGRESS. LIGATURE RESISTANT

3.11 HARDWARE SET # 04: "CORRIDOR - DOUBLE EGRESS"

A. Template Closer to swing 180 degrees where possible.

B. Provide for each Pair (PR) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
		HW HINGES	5BB1HW 4.5 X 4.5	652	IVE

2 EA	POWER TRANSFER	EPT10	689	VD
2 EA	ELECTRIFIED EXIT DEVICE	LX-RX-QEL-99-L-F-HM-D	626	VD
1 EA	DOOR POSITION SWITCH	679-05HM		SCH
2 EA	SURFACE CLOSER	4040XP EDA	689	LCN
2 EA	KICKPLATE	8400-B4E-CS 10 X 2 INCH LDW	630	IVE
2 EA	ELECTROMAGNETIC HOLD-OPEN	EM500G MAT		DMA
	WEATHERSTRIPPING	188FS ZAG	BK	ZRO
4 EA	SILENCER	SR64	GRY	IVE
1 EA	POWER SUPPLY	PS902 900-2RS		VD

C. OPERATIONAL DESCRIPTION: ALWAYS UNLOCKED. DOORS ALLOW FREE EGRESS AT ALL TIMES. FAIL-SAFE - MAGNETIC HOLD-OPENS ALLOW FIRE DOORS TO BE RELEASED AND CLOSE AUTOMATICALLY WHEN FIRE ALARM SIGNALS.

END OF SECTION

SECTION 08 7163

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 of 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.

A. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of electrical and/or mechanical components.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering or detention use.

B. Warranty Period: One (1) year from date of Substantial Completion.

C. 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.

A. Hinges:
1. Specified – NW Specialty Hardware (NW)
2. Acceptable – Willoughby (WB)
3. Acceptable – Approved equal

B. Locksets:
1. Specified – RR Brink (BR)
2. Acceptable – Approved equal

C. Electric Strikes:
1. Specified – Securitron (SU)
2. Acceptable – Approved equal

D. Sliding Door Operators:
1. Specified – RR Brink (BR)
2. Acceptable – Approved equal

E. Concealed Door Closers:
1. Specified – LCN (LC)
2. Acceptable – Approved equal

F. Door Pulls:
1. Specified – NW Specialty Hardware (NW)
2. Acceptable – Willoughby (WB)
3. Acceptable – Approved equal

G. Acceptable – Approved equal

H. Thresholds and Gasket:
1. Specified – National Guard Products (NG)
2. Acceptable – Approved equal

I. Floor/Wall Stops:
1. Specified – NW Specialty Hardware (NW)
2. Acceptable – Approved equal

J. Switches:
1. Specified – RR Brink (BR)
2. 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.	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: NW 645FMST

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 deadlocked 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 Deadbolt – Basis of design: 7010 Series

1. Investment cast steel lock case, zincplated.
2. Stainless steel deadbolt.
3. Bolt throw: 5/8”.
4. Bolt size: 1-1/2” x 3/4”.
5. Provide bolt keeper with dust box (7010KD).
6. Provide locks for Hollow Metal Mounting (specify FHM).

C. Mechanical Food Pass/Cuff Port Lock – Basis of design: 7017 Series

1. Investment cast steel lock case, zincplated.
2. Stainless steel latch.
3. Latch size: 1-1/2” x 3/4”

D. Mechanical Automatic Deadlatch – Basis of design: 7070 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: 7080 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. Mechanical Automatic Deadlatch – Basis of design: 1040 Series

1. Stainless steel lock case, armor front, springs, and working parts.
2. Solid forged-brass trim cannot be removed when the door is in the closed and locked position. Conceal all mounting screws. A locked or inactive knob spins freely to prevent forced breakage of the lock works.
3. Latch made of stainless steel with a full 3⁄4” throw.
4. Stainless steel strike plate.
5. Exposed fasteners – pinned “Torx” head.
6. Provide a lever handle and track set. Specify Lever Eskort (LE).

F. Sliding Door Operators – Basis of design: 57700 Series

1. Unlock, open and lock open a 3'-0" door in not more than seven (7) seconds.
2. Unlock, close and deadlock close a 3'-0" door in not more than seven (7) seconds.
3. Stop the movement of any door in mid-travel by applying approximately 40 lbs. of pressure on the door.
4. A freewheeling door shall be acceptable, while in manual or emergency mode.
5. Instantly reverse the direction of the door. In the event the door is blocked, the door shall automatically continue to the open or closed position when the obstruction is removed.
6. Normal force exerted by a door in travel is 40 lbs.
7. The locking device shall be designed so that there will be no projecting lugs on the receiver column. Door shall automatically deadlock closed at a minimum of two points at rear of door. Front locking shall not be acceptable.
8. In the event of power failure, the door shall have capabilities of being unlocked with a paracentric key from either side of door.

9. The paracentric key cylinder shall be located within a 10-gauge steel, hip high, manual release pilaster adjacent to the closing jamb of the door. Door can be moved by hand and will automatically lock upon reaching the fully opened or closed position.
10. All motors shall be 1/8 horsepower, single phase, 115V, 60 Hertz, as manufactured by a nationally recognized manufacturer.
11. Hanger carrier to be 3/16" thick steel plate, full width of door.
12. Hanger carrier rollers to be turned from solid steel 3" O.D. Formed track is not acceptable.
13. Rollers are to have anti-friction ball bearings with hardened members and grease shield on both sides.
14. The horizontal mechanism housing shall be constructed of 3/16" mild steel plate.
15. Housing covers shall be constructed of 10-gauge sheet steel. All openings shall be baffled.
16. The vertical lock bar housing shall be constructed of 1/8" mild steel tube to be 1" x 2" and the lock bar to be constructed of 5/8" square cold rolled bar steel, free moving within housing.
17. All removable housing covers shall be locked to the track box with Torx head w/center pin security screws.
18. Paint entire assembly, except track, rollers and drive mechanism, with rust inhibitive primer.
    1. UL Listed to 3 hours per UL10B.

G. KEYS AND KEYING

1. The DEC will meet with the Architect and Owner to review the keying schedule and systems lay-out. 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.
3. Provide five (5) keys per master level.
4. Paracentric type cylinder shall be keyed alike in sets, no master key.
   a. Provide five (5) keys per key alike set.
5. All keys shall be stamped with number or letter combination as directed.

H. KEY CONTROL SYSTEM

A. Key Cabinets and components as manufactured by Telkee, out of 18-gauge steel (minimum). System shall include completely set up three-way cross index system, installation of keys and tag system, and instructions to the owner on proper use of the system. Cabinet to be size to accommodate one complete set of all detention building keys. Allow for 50% future expansion.

2.04 – DOOR CLOSERS – Basis of design: LCN 2210 Series

A. Vandal resistant design for concealed mounting.
B. Handed for right or left swinging doors.
C. Closers to meet ADA reduced opening force requirements.
D. All closers furnished with Torx tamper resistant machine screws
E. Full rack and pinion hydraulic action.
F. UL certified for three hours in compliance with UL10C.
G. 10-year warranty.

2.05 – DOOR POSITION SWITCHES – Basis of design: 201020 or 201023 Series

A. Furnish magnetic concealed door position switches, Triple-Biased (201023) where specified. Switch is single pole double throw type with rating of .5 amps at 24V maximum.

2.06 – MISCELLANEOUS HARDWARE

A. Combo Pull: As specified in the hardware sets: NWSH – NW701
B. Loop Pull: As specified in the hardware sets: NWSH – NW 601
C. Protection plates (kick and armor) shall be .050 thick type 304 stainless steel. Kickplates shall be 8" high. Plates shall be 2" less than door width. All protection plates are to be mounted with stainless steel pop rivets.

D. 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 to have bumper type weatherstripping.
E. Threshold and weather seal: As specified in hardware sets.

PART 3 – EXECUTION

3.01 – EXAMINATION

A. 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.
B. Examine rough-in for embedded and built-in anchors to verify actual locations of detention door hardware connections before detention door hardware installation.
C. Inspect built-in and cast-in anchor installations, before installing detention door hardware, to verify that anchor installations comply with requirements. Prepare inspection reports.
D. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
E. Perform additional inspections to determine compliance of replaced or additional work.
F. Verify locations of detention door hardware with those indicated on shop drawings.
G. Examine rough-in for electrical power systems to verify actual locations of connections before detention door hardware installation.
H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 – PREPARATION

A. Steel Detention Doors and Frames: Comply with BHMA A156.115 Series.
B. Surface-Applied Detention Door Hardware: Drill and tap detention doors and frames according to SDI A250.6.

3.03 – INSTALLATION

A. Mounting Heights: Mount detention door hardware units at heights indicated in DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
B. 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.
C. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
E. 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.
F. 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

A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and/or deviations from the Contract Document.
B. After installing electrically powered detention door hardware and after electrical circuitry has been energized, test detention door hardware for compliance with requirements:
   1. Operate lock of each door and group of doors in normal remote, normal local, and emergency operating modes.
   2. Verify that remote controls operate correct door locks and in correct sequence.
C. Verify that lock bolts engage strikes with required bolt projection.

D. Verify that detention door hardware is installed, connected, and adjusted according to the contract documents.
E. Verify that electrical wiring installation complies with manufacturer's submittal and written installation requirements.
F. Detention work will be considered defective if it does not pass tests and inspections.
G. Perform additional inspections to determine compliance of replaced or additional work.
H Prepare field quality-control certification endorsed by detention specialist that states installed products comply with requirements in the contract documents.
I. Prepare test and inspection reports.

3.05 – ADJUSTING

A. A. 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.
B. Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

3.06 – CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by detention door hardware installation.
B. Clean operating items as necessary to restore proper function and finish.
C. 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:

Hardware Set S01.1 Masonry Cell

Each to receive:

	3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
	1	EA	Elect Jamb Lock	5022M-MSLH 24VDC	RR Brink
	1	EA	Loop Pull	NW601 US32D	NW Spec Hdwe
	1	EA	Flush Pull	Titan #2 (By door mfr.) USP	Titan Door Co.
	1	EA	Wall Stop	NW706 BLACK	NW Spec Hdwe
	3	EA	Silencer	608	Rock-wood
	1	EA	Magnetic DPS	201020 US32D	RR Brink

Hardware Set S01.2 Masonry Cell - FP

Each to receive:

	3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
	2	EA	FP Hinge	NW631 FPB US32D	NW Spec Hdwe
	1	EA	Elect Jamb Lock	5022M-MSLH 24VDC	RR Brink
	1	EA	Deadbolt	7012 x FHM x 7010KD ESC (1-WAY)	RR Brink
	1	EA	Loop Pull	USP NW601 US32D	NW

Spec Hdwe	1	EA	Flush Pull	Titan #2 (By door mfr.) USP	Titan
Door Co.	1	EA	Wall Stop	NW706 BLACK	NW
Spec Hdwe	3	EA	Silencer	608	Rock-
wood	1	EA	Magnetic DPS	201020 US32D	RR
Brink					

Hardware Set S01.3 SteelCell

Each to receive:

	3	EA	Hinge	By Door Manufacturer	By
Others	2	EA	FP Hinge	By Door Manufacturer	By
Others	1	EA	Elect Jamb Lock	5022M-MSLH 24VDC	RR
Brink	1	EA	Deadbolt	7012 x FHM x 7010KD ESC (1-WAY)	RR
Brink	1	EA	Loop Pull	USP NW601 US32D	NW
Spec Hdwe	1	EA	Flush Pull	Titan #2 (By door mfr.) USP	Titan
Door Co.	1	EA	Wall Stop	NW706SC BLACK	NW
Spec Hdwe	3	EA	Silencer	608	Rock-
wood	1	EA	Magnetic DPS	201020 US32D	RR
Brink					

Hardware Set S01.4 Masonry Cell - FP & Closer

Each to receive:

	3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW
Spec Hdwe	2	EA	FP Hinge	NW631 FPB US32D	NW
Spec Hdwe	1	EA	Elect Jamb Lock	5022M-MSLH 24VDC	RR
Brink	1	EA	Deadbolt	7012 x FHM x 7010KD ESC (1-WAY)	RR
Brink	1	EA	Loop Pull	USP NW601 US32D	NW
Spec Hdwe	1	EA	Flush Pull	Titan #2 (By door mfr.) USP	Titan
Door Co.	1	EA	Closer	2214 AL	LCN
Closers	1	EA	Wall Stop	NW706 BLACK	NW
Spec Hdwe	3	EA	Silencer	608	Rock-
wood	1	EA	Magnetic DPS	201020 US32D	RR
Brink					

Hardware Set S01.5 Padded Cell

Each to receive:

3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
1	EA	Elect Jamb Lock	5022M-MSLH 24VDC	RR Brink
1	EA	Loop Pull	NW601 US32D	NW Spec Hdwe
1	EA	Flush Pull	Titan #2 (By door mfr.) USP	Titan Door Co.
1	EA	Closer	2214 AL	LCN Closers
1	EA	Wall Stop	NW706 BLACK	NW Spec Hdwe
3	EA	Silencer	608	Rockwood
1	EA	Magnetic DPS	201020 US32D	RR Brink

Hardware Set S01.6 SteelCell w/ CKS

Each to receive:

3	EA	Hinge	By Door Manufacturer	By Others
2	EA	FP Hinge	By Door Manufacturer	By Others
1	EA	Elect Jamb Lock	5022M-MSLH-CKS 24VDC	RR Brink
1	EA	Deadbolt	7012 x FHM x 7010KD ESC (1-WAY) USP	RR Brink
1	EA	Loop Pull	NW601 US32D	NW Spec Hdwe
1	EA	Flush Pull	Titan #2 (By door mfr.) USP	Titan Door Co.
1	EA	Wall Stop	NW706SC BLACK	NW Spec Hdwe
3	EA	Silencer	608	Rockwood
1	EA	Magnetic DPS	201020 US32D	RR Brink

Hardware Set S02.1 Masonry Cell - Slam Lock

Each to receive:

3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
1	EA	Slam Lock	7072 x FHM x 7070KS	RR Brink
1	EA	Loop Pull	NW601 US32D	NW Spec Hdwe
1	EA	Flush Pull	Titan #2 (By door mfr.) USP	Titan Door Co.
1	EA	Wall Stop	NW706 BLACK	NW Spec Hdwe
3	EA	Silencer	608	Rockwood
1	EA	Magnetic DPS	201020 US32D	RR Brink
4	EA	Installation	Hour	Pauly Jail

Hardware Set S02.2 Masonry Cell - Slam Lock & FP

Each to receive:

3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
2	EA	FP Hinge	NW631 FPB US32D	NW Spec Hdwe
1	EA	Deadbolt	7012 x FHM x 7010KD ESC (1-WAY) USP	RR Brink
1	EA	Slam Lock	7072 x FHM x 7070KS	RR Brink
1	EA	Loop Pull	NW601 US32D	NW Spec Hdwe
1	EA	Flush Pull	Titan #2 (By door mfr.) USP	Titan Door Co.
1	EA	Wall Stop	NW706 BLACK	NW Spec Hdwe
3	EA	Silencer	608	Rockwood
1	EA	Magnetic DPS	201020 US32D	RR Brink

Hardware Set S03.1 Chase Door

Each to receive:

3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
1	EA	Deadbolt	7012 x FHM x 7010KD ESC (1-WAY) USP	RR Brink
1	EA	Wall Stop	NW706 BLACK	NW Spec Hdwe

Hardware Set S03.2 Security Access Panel

Each to receive:

2	EA	Hinge Weld-On	NW630W x HT USP	NW Spec Hdwe
1	EA	Deadbolt	7016 x 1/2" proj. x 1 ESC (1-WAY) USP	RR Brink

Hardware Set S04.1 Corridor/General Use

Each to receive:

3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
1	EA	Elect Jamb Lock	5026M-MSLH 24VDC	RR Brink
1	EA	Loop Pull	NW601 US32D	NW Spec Hdwe
1	EA	Combo Pull	NW701 US32D	NW Spec Hdwe
1	EA	Closer	2214 AL	LCN Closers
1	EA	Wall Stop	NW706 BLACK	NW Spec Hdwe
3	EA	Silencer	608	Rockwood
1	EA	Magnetic DPS	201020 US32D	RR Brink

Hardware Set S04.2 Corridor/General Use - Oversize

Each to receive:

4	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
1	EA	Elect Jamb Lock	5026M-MSLH 24VDC	RR Brink
1	EA	Loop Pull	NW601 US32D	NW Spec Hdwe
1	EA	Combo Pull	NW701 US32D	NW Spec Hdwe
1	EA	Closer	2214 AL	LCN Closers
1	EA	Wall Stop	NW706 BLACK	NW Spec Hdwe
3	EA	Silencer	608	Rockwood
1	EA	Magnetic DPS	201020 US32D	RR Brink

Hardware Set S04.3 Dayroom Door

Each to receive:

3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
2	EA	FP Hinge	NW631 FPB US32D	NW Spec Hdwe
1	EA	Elect Jamb Lock	5026M-MSLH 24VDC	RR Brink
1	EA	Deadbolt	7012 x FHM x 7010KD ESC (1-WAY) USP	RR Brink
1	EA	Loop Pull	NW601 US32D	NW Spec Hdwe
1	EA	Combo Pull	NW701 US32D	NW Spec Hdwe
1	EA	Closer	2214 AL	LCN Closers
1	EA	Wall Stop	NW706 BLACK	NW Spec Hdwe
3	EA	Silencer	608	Rockwood
1	EA	Magnetic DPS	201020 US32D	RR Brink

Hardware Set S04.4 Dayroom Door w/CKS

Each to receive:

3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
2	EA	FP Hinge	NW631 FPB US32D	NW Spec Hdwe
1	EA	Elect Jamb Lock	5026M-MSLH-CKS 24VDC	RR Brink
1	EA	Deadbolt	7012 x FHM x 7010KD ESC (1-WAY) USP	RR Brink
1	EA	Loop Pull	NW601 US32D	NW Spec Hdwe
1	EA	Combo Pull	NW701 US32D	NW Spec Hdwe
1	EA	Closer	2214 AL	LCN Closers
1	EA	Wall Stop	NW706 BLACK	NW Spec Hdwe
3	EA	Silencer	608	Rockwood
1	EA	Magnetic DPS	201020 US32D	RR Brink

Hardware Set S05.1 Corridor Slider

Each to receive:

1	EA	Sliding Device	57700ECP x K2S USP	RR Brink
1	EA	Loop Pull	NW601 US32D	NW Spec Hdwe
1	EA	Flush Pull	Titan #1 (By door mfr.) USP	Titan Door Co.

Hardware Set S05.2 Corridor Slider - Gasket

Each to receive:

1	EA	Sliding Device	57700ECP x K2S USP	RR Brink
1	EA	Loop Pull	NW601 US32D	NW Spec Hdwe
1	EA	Flush Pull	Titan #1 (By door mfr.) USP	Titan Door Co.
3	EA	Gasketing	5050C x Door height	National Guard
2	EA	Sweep	601A x Clear opening + 2.5"	National Guard
1	EA	Sweep	603A x Clear opening + 2.5"	National Guard
1	EA	Removable Door Skirt	7 GA. x 3.5" x Clear opening + 2.5"	Titan Door Co.

Hardware Set S06.1 Dayroom to Dayroom

Each to receive:

3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
1	EA	Elect Jamb Lock	5026M-MSLH 24VDC	RR Brink
2	EA	Combo Pull	NW701 US32D	NW Spec Hdwe
1	EA	Closer	2214 AL	LCN Closers
1	EA	Wall Stop	NW706 BLACK	NW Spec Hdwe
1	EA	Threshold	8135S 36" TORX #10 x 1-1/2" SMS x PA	National Guard
1	EA	Gasketing	5050C - 17'	National Guard
1	EA	Magnetic DPS	201020 US32D	RR Brink

Hardware Set S07.1 Storage/Janitor

Each to receive:

3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
1	EA	Deadbolt	7086 x FHM x 7080KD ESC (1-WAY) USP	RR Brink
1	EA	Wall Stop	NW706 BLACK	NW Spec Hdwe
3	EA	Silencer	608	Rockwood

Hardware Set S07.2 Storage/Janitor - Monitored

Each to receive:

3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
1	EA	Deadbolt	7086 x FHM x 7080KS ESC (1-WAY) USP	RR Brink
1	EA	Wall Stop	NW706 BLACK	NW Spec Hdwe
3	EA	Silencer	608	Rockwood
1	EA	Magnetic DPS	201020 US32D	RR Brink

Hardware Set S08.1 Lever Lockset

Each to receive:

3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
1	EA	Mech Lock	1042-401 x LE US32D	RR Brink
1	EA	Closer	2214 AL	LCN Closers
1	EA	Wall Stop	NW706 BLACK	NW Spec Hdwe
3	EA	Silencer	608	Rockwood

Hardware Set S08.2 Lever Lockset - Monitored

Each to receive:

3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
1	EA	Mech Lock	1042-401 x LE US32D	RR Brink
1	EA	Closer	2214 AL	LCN Closers
1	EA	Wall Stop	NW706 BLACK	NW Spec Hdwe
1	EA	Silencer	608	Rockwood
1	EA	Magnetic DPS	201020 US32D	RR Brink
1	EA	Keeper Switch	201040	RR Brink

Hardware Set S08.3 Lever Lockset - Elect Strike

Each to receive:

3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
1	EA	Mech Lock	1042-401 x LE US32D	RR Brink
1	EA	Electric Strike	1006CLB-LBSM 630	HES
1	EA	SMART Pac Bridge Rectifier	2005M3	HES
1	EA	Closer	2214 AL	LCN Closers
1	EA	Wall Stop	NW706 BLACK	NW Spec Hdwe
3	EA	Silencer	608	Rockwood
1	EA	Magnetic DPS	201020 US32D	RR Brink

Hardware Set S09.1 Exterior/Secure Preimeter

Each to receive:

3	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
1	EA	Elect Jamb Lock	5026M-MSLH 24VDC	RR Brink
1	EA	Loop Pull	NW601 US32D	NW Spec Hdwe
1	EA	Combo Pull	NW701 US32D	NW Spec Hdwe
1	EA	Closer	2214 AL	LCN Closers
1	EA	Floor Stop	NW606 BLACK	NW Spec Hdwe
1	EA	Threshold	896S 36" TORX #10 x 1-1/2" SMS x PA	National Guard
1	EA	Gasketing	161SA AL 36" x 84"	National Guard
1	EA	Magnetic DPS	201020 US32D	RR Brink

Hardware Set S09.2 Exterior/Secure Preimeter - Oversize

Each to receive:

4	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
1	EA	Elect Jamb Lock	5026M-MSLH 24VDC	RR Brink
1	EA	Loop Pull	NW601 US32D	NW Spec Hdwe
1	EA	Combo Pull	NW701 US32D	NW Spec Hdwe
1	EA	Closer	2214 AL	LCN Closers
1	EA	Floor Stop	NW606 BLACK	NW Spec Hdwe
1	EA	Threshold	896S 48" TORX #10 x 1-1/2" SMS x PA	National Guard
1	EA	Gasketing	161SA AL 48" x 84"	National Guard
1	EA	Magnetic DPS	201020 US32D	RR Brink

Hardware Set S20 Spare Parts

Each to receive:

6	EA	Hinge	NW645 FMST x #30 Torx US32D	NW Spec Hdwe
2	EA	Elect Jamb Lock	5020M-MSLH 24VDC	RR Brink
20	EA	Cut Keys	Paracentric	RR Brink
50	EA	Cut Keys	Mogul	RR Brink
2	EA	Closer	2214 AL	LCN Closers
4	EA	Magnetic DPS	201020 US32D	RR Brink
1	EA	Switch	4 each Type Used	RR Brink
1	EA	Slider Motor	57700 - Gear	RR Brink
1	EA	Motor Control Module	57700 - MCM	RR Brink
2	EA	Dyn Brake Mod.	P/N 010401-000	RR Brink
1	EA	Test Box - Device	P/N B00080-00	RR Brink
1	EA	Test Box - 24VDC	P/N B00068-A	RR Brink
2	EA	Torx Set	Torx Set	RR Brink

END OF SECTION

SECTION 08 8000

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds.

1.02 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

F. ASTM C1036 - Standard Specification for Flat Glass; 2021.

G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

H. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.

I. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

J. ASTM C1349 - Standard Specification for Architectural Flat Glass Clad Polycarbonate; 2017.

K. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

L. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

M. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

N. ASTM F1233 - Standard Test Method for Security Glazing Materials And Systems; 2008 (Reapproved 2019).

O. GANA (GM) - GANA Glazing Manual; 2008.

P. GANA (SM) - GANA Sealant Manual; 2008.

Q. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.

R. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2016).

S. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2020.

T. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2020.

U. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2020.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Insulating Glass Units: One of each glass size and each glass type.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.06 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Provide on-site glazing mock-up with the specified glazing components.

C. Locate where directed.

D. Mock-ups may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to specified destination in manufacturer or distributor’s packaging, undamaged, complete with installation instructions.

B. Store off ground, under cover, protected from weather and construction activities.

1.08 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a ten (10) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

D. Polycarbonate Sheet Glazing: Provide a ten (10) year manufacturer warranty to include coverage for breakage, coating failure, abrasion resistance, including providing products to replace failed units.

E. Glass-Clad Polycarbonate Sheet Glazing: Provide a five (5) year manufacturer warranty to include coverage for breakage, coating failure, abrasion resistance, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Float Glass Manufacturers:
   1. Guardian Glass, LLC: www.guardianglass.com/#sle.
   2. Pilkington North America Inc: www.pilkington.com/na/#sle.
   3. Saint Gobain North America: www.saint-gobain.com/#sle.
   4. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Design Pressure: Calculated in accordance with ASCE 7.
   2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   3. Seismic Loads: Design and size glazing components to withstand seismic loads and sway displacement in accordance with the requirements of ASCE 7.
   4. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   5. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
   1. In conjunction with weather barrier related materials described in other sections, as follows:
      a. Air Barriers: See Section 07 2700.
   2. To utilize inner pane of multiple pane insulating glass units for continuity of vapor retarder and/or air barrier seal.
   3. To maintain a continuous vapor retarder and/or air barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
   2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
   3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
   4. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category II impact test requirements.
   2. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch thick, minimum.

2.04 INSULATING GLASS UNITS

A. Manufacturers:

1. Guardian Glass, LLC: www.guardianglass.com/#sle.
2. Pilkington North America Inc: www.pilkington.com/na/#sle.
3. Viracon, Apogee Enterprises, Inc: www.viracon.com/#sle.
4. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.

B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

C. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Warm-Edge Spacers: Low-conductivity thermoplastic with dessicant warm-edge technology design.
   a. Spacer Width: As required for specified insulating glass unit.
   b. Spacer Height: Manufacturer's standard.
4. Spacer Color: Black.
5. Edge Seal:
   a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
   b. Color: Black.
6. Purge interpane space with dry air, hermetically sealed.

D. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with argon.
3. Outboard Lite: Laminated, 1/4 inch thick, minimum.
   a. Tint: Clear.
   b. Coating: Low-E (passive type), on #2 surface.
4. Warm-edge spacer.
5. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
6. Total Thickness: 1 inch.
7. See Drawings for minimum thermal transmittance (U-Value) and solar heat gain coefficient (SHGC).

E. Type IG-2 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing units noted as translucent glazing.
2. Space between lites filled with argon.
3. Outboard Lite: Laminated, 1/4 inch thick, minimum.
   a. Tint: Clear.
   b. Coating: Low-E (passive type), on #2 surface.
4. Warm-edge spacer.
5. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
   a. Tint: Translucent acid etched.
6. Total Thickness: 1 inch.
7. See Drawings for minimum thermal transmittance (U-Value) and solar heat gain coefficient (SHGC).

2.05 BASIS OF DESIGN - INSULATING GLASS UNITS

A. Basis of Design - Guardian Glass, LLC: www.guardianglass.com/#sle.
1. Outboard Lite: 1/4 inch thick laminated pane, minimum of the type specified below.
   a. Standard Glass: Fully tempered float glass,1/8 inch each layer, with PVB interlayer.
      1) Coating:
         (a) Low-E Coating: SunGuard SN 54 on #2 surface.

2. Inboard Lite: Annealed float glass, 1/4 inch thick.
    a. Coating: No coating on inboard lite.
    b. Glass (IG-1): Clear.
    c. Glass (IG-2): SatinDeco.

2.06 GLAZING UNITS

A. Type G-3 - Monolithic Safety Glazing: Non-fire-rated.
    1. Applications:
        a. Glazed lites in doors, except fire doors.
        b. Glazed sidelights to doors, except in fire-rated walls and partitions.
        c. Other locations required by applicable federal, state, and local codes and regulations.
        d. Other locations indicated on drawings.
    2. Glass Type: Laminated safety safety glass as specified.
    3. Tint: Clear.
    4. Thickness: 1/4 inch, nominal.

B. Type G-6 - Security Glazing: Laminated glass, 2-Ply, with anti-reflective glazing. Provide safety glazing labeling.
    1. Applications: Locations as indicated on drawings, such as architectural glazed lites in windows, doors, and sidelights. Refer to Section 08 5663 and 08 8853 for Detention Windows and Security Glazing in detention grade windows and doors.
    2. Tint: Clear.
    3. Thickness: As required to meet performance criteria.
    4. Outer Lite: Tempered glass.
    5. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
    6. Inside Lite: Tempered glass. Anti-reflective glass with physically bonded surface coatings to reduce reflection and glare.
    7. Performance Criteria:
        a. Forced Entry Resistance: Pass ASTM F1233 tests in compliance with Forced Entry Sequence of Testing, Class Achieved 1.2: 1-1/2 inch (4 cm) Diameter Pipe/Sledge, 25 impacts.
    8. Glazing Method: As required to meet performance criteria.

C. Type G-7 - Glass-Clad Polycarbonate Security Glazing: Laminated glass and polycarbonate, 2-Ply; ASTM C1349, with anti-reflective glazing. Provide safety glazing labeling.
    1. Applications: Locations as indicated on drawings, such as architectural glazed lites in windows, doors, and sidelights. Refer to Section 08 5663 and 08 8853 for Detention Windows and Security Glazing in detention grade windows and doors.
    2. Tint: Clear.
    3. Thickness: As required to meet performance criteria.
    4. Outer Lite: Polycarbonate.
    5. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
    6. Inside Lite: Tempered glass. Anti-reflective glass with physically bonded surface coatings to reduce reflection and glare.

D. Type M-1 - Transparent One-Way Mirror: Mirror quality float glass with pyrolytic (hard coat) type coating located on high light level surface of glass; ASTM C1376.
    1. Applications: Locations as indicated on drawings.
    2. Thickness: 1/4 inch.
    3. Glass Tint: Grey.
    4. Glass Type: Laminated tempered.
    5. Lighting Ratio: Maintain at least 8:1 lighting level ratio between coated side (bright-observed side) and uncoated side (dim-observer side).

2.07 GLAZING COMPOUNDS

A. Butyl Sealant: Single component; ASTM C920, Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

B. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.08 ACCESSORIES

A. General: Provide products of material, size, and shape complying with referenced glazing standard, 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. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

C. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

D. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
   1. Width: As required for application.
   2. Thickness: As required for application.
   3. Spacer Rod Diameter: As required for application.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry immediately before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance

D. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

E. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

F. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

G. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

A. Application - Interior Glazed: Set glazing infills from the interior of the building.

B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

E. Place glazing tape on free perimeter of glazing in same manner described above.

F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

G. Carefully trim protruding tape with knife.

3.05 INSTALLATION - WET/DRY GLAZING METHOD (PREFORMED TAPE AND SEALANT)

A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.

B. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.

C. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.

D. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

E. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.

F. Install removable stops, with spacer strips inserted between glazing and applied stops 1/4 inch below sight lines.
   1. Place glazing tape on glazing pane of unit with tape flush with sight line.

G. Fill gap between glazing and stop with silicone type sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.

H. Apply cap bead of silicone type sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.06 FIELD QUALITY CONTROL

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

3.07 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.08 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 8300
MIRRORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Acrylic plastic mirrors.

B. Polycarbonate mirrors.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

1.03 QUALITY ASSURANCE

A. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.

1.04 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide three year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MATERIALS

A. Polycarbonate Plastic Mirror; Half-Dome: Abrasive resistant; silver; mirrored coating; shatter-proof; 180 degree view, mounts at at intersection of wall and ceiling. Fully enclosed foam insert fills cavity to reduce flexing and enhance strength.
   1. Size: 24 inch diameter.
   2. Product:
      a. Norix Group; Duravision: www.norix.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

A. Mirror Attachment Accessories: Manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

3.03 INSTALLATION

A. Install mirrors in accordance with manufacturer's recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

3.04 CLEANING

A. Remove labels or films after work is complete.

B. Clean mirrors and adjacent surfaces.

END OF SECTION

SECTION 08 8813
FIRE-RATED GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire-rated glazing units.

B. Glazing compounds.

1.02 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

G. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

H. GANA (GM) - GANA Glazing Manual; 2008.

I. GANA (SM) - GANA Sealant Manual; 2008.

J. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.

K. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. ITS (DIR) - Directory of Listed Products; current edition.

M. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

N. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies; 2022.

O. UL (DIR) - Online Certifications Directory; Current Edition.

P. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

Q. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

R. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene preinstallation meeting one week before starting work of this section; require attendance by each of affected installers.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data on Glazing Unit Glazing Types: Provide structural, physical, and environmental characteristics, size limitations, special handling and installation requirements.

C. Certificate: Certify that products of this section meet or exceed specified requirements.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.
   2. Extra Glass Units: One of each glass size and each glass type.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with GANA (GM), GANA (SM), and GANA (LGRM) for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.06 QUALITY ASSURANCE

A. Glazing Standards: FGMA Glazing Manual and Sealant Manual.

B. Fire Protective Rated Glass: Each lite shall bear permanent, non-removable label of UL certifying it for use in tested and rated fire protective assemblies.

C. Fire Protective Glazing Products for Door Assemblies: Products identical to those tested per UL 10B, classified and labeled by UL.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to specified destination in manufacturer or distributor’s packaging, undamaged, complete with installation instructions.

B. Store off ground, under cover, protected from weather and construction activities.

1.08 FIELD CONDITIONS

A. Ambient Conditions: Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during, and 24 hours after installation of glazing compounds.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire-Resistance-Rated Glass:
   1. Manufacturers:
      a. SAFTIFIRST, a division of O'Keeffe's Inc: www.safti.com/#sle.
      b. Technical Glass Products: www.fireglass.com/#sle.
      c. Vetrotech North America: www.vetrotechusa.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads and withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. Provide glass edge support system sufficiently stiff to limit lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   3. Glass thicknesses listed are minimum.

2.03 GLASS MATERIALS

A. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Comply with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.
   2. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch thick, minimum.

2.04 GLAZING UNITS

A. Type FPG-1 - Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve indicated fire rating period of 90 minutes or less.
   1. Applications:

a. Glazing in fire-resistance-rated door assembly.
b. Glazing in fire-resistance-rated window assembly.
c. Other locations as indicated on drawings.

2. Glass Type: Specialty tempered float glass.
3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
4. Safety Glazing Certification: 16 CFR 1201 Category II.
5. Glazing Method: As required for fire rating.
6. Fire-Rating Period: As indicated on drawings. For 20 minute and 90 minute applications.
7. Markings for Fire-Protection-Rated Glazing Assemblies: Provide permanent markings on fire-protection-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction
   a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
   b. "OH" - meets fire window assembly criteria, including hose stream test of NFPA 257 or UL 9 fire test standards.
   c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire tests standards.
   d. "XXX" - placeholder that represents fire-rating period, in minutes.
8. Products:
   a. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite I-XL/SuperLite X: www.safti.com/#sle.
   b. Technical Glass Products; Firelite Plus: www.fireglass.com/#sle.
   c. Vetrotech North America; Keralite/Select Laminated: www.vetrotechusa.com/#sle.

2.05 GLAZING COMPOUNDS

A. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.06 ACCESSORIES

A. Setting Blocks: Neoprene, silicone, or EPDM, with 70 to 90 Shore A durometer hardness; ASTM C864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Glazing Tape: Closed-cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to affect air barrier and vapor retarder seal.

C. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.07 FABRICATION

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that minimum required face and edge clearances are provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry immediately before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION - GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers unless more stringent requirements are indicated, including those in referenced glazing standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.

D. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

E. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

F. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

G. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.

H. Place setting blocks located at quarter points of glass with edge block no more than 6 inches from corners.

I. Glaze vertically into labeled fire-rated metal frames or partition walls with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.

J. Place glazing tape on free perimeter of glazing in same manner described above.

K. Install removable stop and secure without displacement of tape.

L. Use specified glazing compound, without adulteration; bed glazing material in glazing compound; entirely fill all recess and spaces. Provide visible glazing compound with smooth and straight edges.

M. Install vision panels in fire-rated doors to requirements of NFPA 80.

N. Install so that appropriate UL markings remain permanently visible.

O. Prevent glass from contact with contaminating substances that may result from construction operations including, but not limited to weld spatter, fire-safing, plastering, mortar droppings, etc.

3.04 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than four days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.05 PROTECTION

A. After installation, mark pane with 'X' by using removable plastic tape or paste; do not mark heat-absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

3.06 SCHEDULES

A. Hollow Metal Steel Frames, Interior Glazing, 20 minute: Type FPG-1.

B. Hollow Metal Steel Door, Interior Glazing, 90 minute, Not exceeding 100 sq. in.: FPG-1.

END OF SECTION

SECTION 08 8853

SECURITY GLASS AND GLAZING

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Glazing materials and related accessories required for complete installation in security doors, frames, windows and other construction as indicated on drawings or specified.
B. Related Sections:
    a. 08 34 53 - Security Hollow Metal Doors and Frames

1.02 REFERENCES

A. Standards of the following:
    a. American National Standards Institute (ANSI), "Safety Performance Standards and Methods of Tests for Safety Glazing Materials Used in Buildings," Z97.1-1984(R1994).
    b. American Society for Testing and Materials (ASTM), standards as referenced herein.
    c. Consumer Product Safety Commission (CPSC), "Safety Standard for Architectural Glazing Materials," 16-CFR, Part 1201, Latest Edition.
    d. Glass Association of North America (GANA), "Glazing Manual," Latest Edition.
    e. National Fire Protection Association (NFPA), standards as follows:
        i. NFPA 80-1999, "Standard for Fire Doors and Fire Windows."
        ii. NFPA 257-2000, "Standard on Fire Test for Window and Glass Block Assemblies."
    f. H.P. White Laboratories, Inc. (HPW), "Test Procedure – Transparent Materials for Use in Forced Entry or Containment Barriers," HPW-TP-0500.02.
    g. Walker, McGough, Foltz, and Lyerla (WMFL), standards as follows:
        i. WMFL 30 Minutes Forced Entry Test.
        ii. WMFL 60 Minutes Forced Entry Test.
    h. Underwriters Laboratories (UL), "Standard for Burglary Resistant Glazing Material," UL 972-1995.
    i. ASTM F-1915 Standard Test Method for Detention Glazing

1.03 DEFINITIONS:

A. Glass or Glazing: The term "glass" or "glazing" used throughout this specification section shall refer to any of the glass and glazing material products specified and scheduled; including polycarbonate, laminated polycarbonate and other indicated glass types.

1.04 SUBMITTALS:

A. Product Data: Submit for each type security glazing material indicating performance characteristics.
    a. Include manufacturer's recommendations for glass bite, clearances and glazing methods.
    b. Include technical data and instructions for storage and handling of materials.
B. Test Reports: Submit test reports by an independent testing agency indicating compliance with specified security performance requirements.
C. Samples:
    a. Glazing material: Submit minimum 4-inch by 4-inch samples of each type of glazing material proposed for use.

b. Glazing accessories: Submit samples of each type accessory as specified, if requested by Architect.
    i. Glazing tape: Minimum 12-inch (1'-0") length sample of each type glazing tape material proposed for use.
    ii. Setting and edge block materials: One sample each of typical edge block and setting block materials.

D. Adhesion Compatibility Test Results: Submit for Architect's information only. Submit results of compatibility adhesion testing by glazing sealant manufacturer indicating that adhesion testing has been performed on actual samples of polycarbonate glazing material. Test shall determine if materials are compatible and adhesion is acceptable. Indicate requirements for primers or special preparation required to ensure proper adhesion of materials.

E. Maintenance Data: Submit security glazing material manufacturer's maintenance data for cleaning and care of each type of glazing material installed. Include data in operations and maintenance manuals submitted with Contract Closeout documents.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Security glazing installer shall have minimum Five (5) years experience in the successful installation of glazing materials same as those specified for this Project. If requested by Architect, submit references for projects completed within the past three years.

B. Regulatory Requirements:
    a. Polycarbonate glazing: Complying with building code requirements for approved light transmitting plastics as specified.
        i. Southern Building Code Congress International (SBCCI) - Report Number 8788 Class CC-1 Approved Plastic.
        ii. International Congress of Building Officials (ICBO) - Uniform Number 3286 Approved Plastic.
    b. Safety Glazing: Comply with requirements for installation of safety glazing materials at hazardous locations as defined in governing building code.

C. Single Source Requirements: Each type of security glazing material installed throughout Project, whether used in a monolithic state or as lites in laminated units, shall be the products of a single manufacturer.

D. Labels:
        1. Glazing shall bear manufacturer's label identifying type, quality and thickness of material. Labels for plastic glazing materials, if not available on each lite, shall at least be factory applied to shipping crates. All other glazing materials shall be required to bear labels on each lite either temporary or permanent types as required by governing building codes or certification agency where specified.
    b. Tempered glass shall have permanent etched or ceramic fired identification on each unit indicating compliance with safety glazing standard. Identification shall be visible in completed installation and oriented in an inconspicuous corner.

E. E. Mock-Up: Install specified glazing material in a security hollow metal door view panel opening and a borrowed lite framed opening as a job mock-up for Architect's review and acceptance.
        1. Prepare mock-up at least seven (7) days prior to start of glazing work, and coordinate with the Architect’s regular site visiting schedule. Should mock-up be unacceptable to Architect, prepare additional mock-ups until acceptance is obtained.
        2. Mock-up shall indicate the following:
    ii. Glazing material type.
    iii. Glass bite, face and edge clearances of glazing pocket.
    iv. Glazing installation methods, including setting block locations, and glazing tape.
    v. Workmanship.
    b. Maintain accepted mock-up throughout installation as a standard for glazing work. Accepted mock-up may remain as part of the finished work.

F. Pre-installation Conference: Prior to beginning security-glazing installation, a pre-glazing conference will be held to review work to be accomplished.

1. Contractor, glazing subcontractor and glazier performing the work, security hollow metal supplier, a representative of glass manufacturer, a representative of sealant manufacturer, and Architect will be present.

2. Contractor shall notify Architect at least five (5) days in advance prior to time of conference.

b. Data submitted by Contractor, accepted job mock-up, interfacing of security glazing and security hollow metal work, including dimensions and tolerances, sealant joint widths and depths and glazing methods, will be reviewed.

1.06 DESIGN AND PERFORMANCE REQUIREMENTS

A. Plastic Glazing: Complying with CPSC 16-CFR, Part 1201, Category II and weathering requirements of ANSI Z97.1.

B. Security Glazing Performance: Security glazing materials shall be identical those passing requirements for Force Entry Resistance of referenced HPW test procedures or WMFL test method as applicable for products specified. Ratings or results shall be comparable to those specified for types and thickness glazing materials scheduled; subject to Architect’s review and acceptance of submitted test data. Requirements of ASTM F-1915 shall also apply herein.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver glazing materials with manufacturer's identification, glass type, and thickness labeled on each piece or on shipping crates as specified. Remove no labels applied to glazing material until final cleaning.
B. Store glazing materials indoors away from direct exposure to the sun, in cool, dry area, off floor, equally supported to prevent stress and breakage.
C. Protect stored glazing materials as recommended by manufacturer to prevent from damaging effects of moisture, condensation, and extreme temperature changes. Maintain temperature in storage areas below 80 degree F.
D. Do not move cases, which have been partially unpacked. Unpack glazing materials in accordance with manufacturer's product data for type of material being handled. Stack individual lites as recommended by manufacturer's product data.
E. Handle glazing materials in manner to prevent damage to face or edges, do not drag, slide or drop units. Utilize rolling blocks to rotate glazing materials.

1.08 WARRANTY

A. Polycarbonate Glazing: Laminated and monolithic polycarbonate glazing materials shall be warranted against breakage, yellowing, loss of light transmission, abrasion, edge separation, delamination, material obstruction of vision thorough glazing, coating failure and against manufacturing defects for a period of minimum Ten (10) Years beginning at Date of Substantial Completion.

B. Glass-Clad Polycarbonate Glazing: Glass clad laminated polycarbonate glazing materials shall be warranted against breakage, yellowing, loss of light transmission, abrasion, edge separation, delamination, material obstruction of vision thorough glazing, coating failure and against manufacturing defects for a period of minimum Five (5) Years beginning at Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 POLYCARBONATE GLAZING

A. Monolithic Polycarbonate:
    a. Acceptable products; subject to compliance with specified requirements
        i. LTI Smartglass
        ii. Global Security Glazing
        iii. McGrory Glass Inc.
    b. Characteristics: Clear, ultra-violet resistant polycarbonate sheet glazing material; coated on both faces with manufacturer's abrasion resistant surface treatment.
        i. Thickness: As scheduled in Part-3 of this section.
        ii. Flexural strength: Minimum 13,500 psi when tested in accord with ASTM D790-00.
        iii. Tensile strength: Minimum 9500 psi ultimate strength when tested in accord with ASTM D638-01.
        iv. Abrasion resistance: Maximum 4 % change in haze when tested in accord with ASTM D1044-99 using Taber abraser subjected to 100 cycles with applied constant load of 500 grams.
        v. Flammability: Less than 1-inch burning when tested in accord with ASTM D635-98 and complying with specified building code requirements for Class CC-1 combustibility classification.
        vi. Security performance: Complying with UL 972 standard.
B. Laminated Polycarbonate:
    a. Acceptable products; subject to compliance with specified requirements:
        i. LTI Smartglass
        ii. Global Security Glazing
        iii. McGrory Glass Inc.
    b. Characteristics: Clear, multi-ply, laminated polycarbonate sheet glazing material bonded with manufacturer's standard interlayer. Outer face sheets shall be coated on exposed surfaces with manufacturer's ultra-violet and abrasion resistant treatment.
        i. Thickness: As scheduled along with specific product identification listed in Part-3 of this section.
        ii. Abrasion resistance and flammability: Same as specified for monolithic polycarbonate.
        iii. Flexural strength: Minimum 13,500 psi when tested in accord with ASTM D790-00.
        iv. Security performance: Complying with specified Forced Entry Resistance requirements.
C. Glass-Clad Polycarbonate:
    a. Acceptable products; subject to compliance with specified requirements:

        i. LTI Smartglass
        ii. Global Security Glazing
        iii. McGrory Glass Inc.

    b. Characteristics: Clear, glass-clad polycarbonate sheet glazing material bonded with manufacturer’s urethane laminating interlayer film. Outer glazing sheets shall be heat strengthened and chemically strengthened annealed glass. Inner layer shall be 3/8” (minimum) polycarbonate core.

        i. Security performance shall comply with H.P White HPW-TP-0500.02 Forced Entry Level 2 (Report WJE 972491).

        ii. Product shall be warranted against defects in material and workmanship resulting in edge separation or delamination for a period of 5 years from the date of

product acceptance.

iii. Product shall comply with the following standards: ASTM C 1349; ASTM C 1048; ASTM C 1036.

2.02 GLAZING ACCESSORIES

A. Setting Blocks: Provide materials compatible with glazing and sealants acceptable to manufacturers.

1. Acceptable products; subject to compliance with specified requirements:
   a. Advance Elastomer Systems, L.P.; Santoprene®.
   Tremco, Inc.; Dense Elastomeric Silicone Rubber Extrusions.
2. Characteristics: Dense elastomeric silicone or thermoplastic elastomers (TPE) rubber extrusions fabricated in to setting and edge blocks for use in glazing and sealing applications; complying with ASTM C864-99.
   a. Setting blocks: 80 to 90 Shore A durometer hardness when tested in accord with ASTM D2240-02.
      Thickness: 0.25-inch (1/4"), unless otherwise indicated.
      Length and width: Minimum 4-inch length by width equal to 1/16-inch to 1/8-inch greater than glazing thickness.
   b. Edge blocks: 60 to 70 Shore A durometer hardness when tested in accord with ASTM D2240-02.
      1) Thickness: 0.125-inch (1/8"), unless otherwise indicated.
      2) Length and width: Minimum 4-inch length by width equal to 1/16-inch to 1/8-inch greater than glazing thickness.

C. Glazing Tapes:

1. Shimless Tape:
   a. Acceptable products; subject to compliance with specified requirements:
      PTI 303 Glazing Tape.
      Tremco, Inc., 440 Tape.
      National Guard Products, Inc. L-GT-118
   b. Characteristics: Preformed, cross-linked butyl tape, 100% solids.
      1) Size: 1/8-inch thickness by 1/2-inch width.
      2) Color: Black-bronze.
2. Pre-shimmed Tape:
   a. Acceptable products; subject to compliance with specified requirements:
      1) PTI 303 Spacer Rod Tape.
      2) Tremco, Inc., Polyshim II Tape.
   b. Characteristics: Preformed, cross-linked buytl or polyisobutylene tape with integral continuous encased shim, 100% solids.
      1) Size: 1/8-inch thickness by 1/2-inch width.
      2) Color: Black-bronze.

2.03 FIRE RESISTANT GLAZING

A. Glazing systems installed within 1 and 2-hour firewalls shall be equivalently rated for that location. The contractor shall reference the architectural Life Safety floorplan drawings for the location of the rated wall assemblies.

B. Where security glazing is shown to be installed within a rated wall, the glazing shall be laminated with ¼" wire glass, on both sides of the security glazing product, to meet the requirements of the rated wall.

C. Acceptable Manufacturers:
The basis of design for the fire resistant glazing systems shall be Global Security Glazing, Inferno-guard product line, to match the equivalent level of containment and security.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine frames and rabbets to which glazing is to be installed. Verify the following prior to beginning glazing work:

1. Framing is anchored secure in position, plumb, square and within specified tolerances.
2. Projections, burrs, irregularities and obstructions are removed from glazing rabbets and are clean and free of debris.
3. Offsets at corners are within specified tolerances.
4. Corners and fabricated intersections are sealed and framing is weather-tight.
5. Rabbets are of sufficient depth and width to receive specified glazing material including required bite, face and edge clearances.
6. Security hollow metal frames have received paint finish as specified in Painting section.

B. Notify Architect if framing or opening conditions are not acceptable to receive specified glazing.

1. Do not proceed with installation of glazing materials until unsatisfactory conditions have been corrected and are acceptable to Architect and installer.
2. Installation of glazing materials to framing by installer shall confirm acceptance that conditions are satisfactory.

3.02 PREPARATION

A. Clean glazing channels and framing free of debris and protective coatings prior to start of glazing work.
1. Remove applied coatings from contact surfaces for wet glazing installation, unless testing indicates acceptable adhesion and compatibility.

3.03 GLAZING INSTALLATION

A. Install glazing materials in accordance with manufacturer's product data and referenced GANA standards, except where more stringent requirements are specified.

B. Glazing installation shall provide for an air-tight and water-tight installation withstanding normal temperature changes without failure.

C. Protect glazing material faces and edges during handling and installation.
Use rolling blocks when rotating glass units.
Do not impact glass with metal framing components.
Use suction cups to shift lites within openings.
Rotate glazing with flares or bevels along horizontal edges occurring in the vicinity of setting blocks so that they are located at top of opening and acceptable to glazing manufacturer.

D. Size glazing for each opening, ensuring correct bite on lite without imposing strain or stresses to material. Fit glazing to frame rabbet stops or channels providing 1-inch bite with plus or minus 1/8-inch tolerance, unless otherwise indicated.

E. Position glazing with pattern and draw oriented in the same direction, and with glass waves parallel to floor.

F. Maintain minimum 1/8-inch bed clearance between glazing material and frame or stop, on both sides of lite, except where greater clearances are required by either glazing material, sealant or framing manufacturer.

G. Install setting blocks to sill rabbet or in sill glazing pocket, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6-inches from corner, unless otherwise required by glazing manufacturer.
   a. Size setting blocks in proportion to glass weight, but provide not less than minimum specified length.
   b. Adhere setting blocks to frame rabbets or channels in thin bed of sealant. Use same sealant material as for heel bead application to set blocks in place.

H. Install edge blocks at vertical jambs and heads to limit lateral movement of glazing material. Provide edge blocks in specified minimum lengths. Maintain 1/8-inch clearance between edge of glass and edge block.

I. Set glazing material by using preformed tape.
   a. Install continuous glazing tape around full perimeter of frame stops on both sides of glazing.
      i. Cut tape to required lengths allowing for tight-butted joints. Do not lap adjoining lengths of glazing tape.
      ii. Set glazing tape positioned so that top edge is 1/4-inch below sight line of stop.
      iii. Remove backing paper from tape just prior to setting glass.
   b. Center glazing within frame rabbet, resting on setting blocks and pressed firm against tape with sufficient pressure to ensure full contact and adhesion at perimeter. Remove and reinstall glazing positioned closer than 1/8-inch required face clearance from frame stops.

3.04 PROTECTION AND CLEANING

A. Upon completion of glazing installation, apply crossed streamers to framing across opening without touching glass to protect work. Do not mark on glazing surfaces.

B. Remove temporary labels and excess sealant from glazing after installation and clean adhesive marks, stains and other residue from surfaces.

C. Protect installed glazing materials from damages throughout construction. Keep glazing clean; do not let dirt, stains, scum, alkali deposits, coating or paint droppings, overspray or other contaminating substances to accumulate on surfaces. If surfaces are found contaminated, remove deposits promptly using manufacturer's recommended procedures.

D. All polycarbonate glazing exposed to direct sunlight shall have it’s masking entirely removed and recovered with plastic poly/duct taped to the frame. Failure to complete this protective task may result in the staining of the glazing or the masking becoming stuck to the polycarbonate.

E. Proper cleaning of the security glazing systems shall be the responsibility of the general contractor. It is recommended that a meeting between the GC, glazing installer, painter, and related trades be conducted to assure that subsequent trades do not damage the glazing.

F. Replace broken, cracked, chipped, abraded, scratched or otherwise damaged glazing materials just prior to Date of Substantial Completion. Damages occurring to glazing materials during construction period shall be replaced at no additional costs to Owner, including those caused by manufacturing defects. vandalism, acts of nature or accidents.

G. Just prior to Date of Substantial Completion, clean both sides of glazing. Clean surfaces using pre-tested detergent and water as recommended by glazing manufacturer. Rinse glazing to remove detergent film with clean water and dry surfaces with soft lint-free cloth or chamois to prevent waterspots.

H. Upon Date of Substantial Completion, instruct Owner's maintenance personnel on the care, cleaning and replacement of glazing materials. Provide glazing manufacturer's factory representative to train Owner's designated personnel in the procedures for cleaning, maintaining and replacing installed glazing materials.

3.05 SCHEDULE OF SECURITY GLAZING TYPES

1. TYPE: SG-0 – 7/16” Nominal, glass clad polycarbonate Global Security Glazing SecurTem+Poly 2119 clear, basis of design.

2. TYPE: SG-1 – 9/16” Nominal, glass clad polycarbonate Global Security Glazing SecurTem+Poly 2117 clear, basis of design. ASTM F-1915 security grade 4, 10-minute containment rated.

3. TYPE: SG-2 – 11/16” Nominal, glass clad polycarbonate Global Security Glazing SecurTem+Poly 2116, clear, ASTM F-1915 Security Grade 3 (20 min) and ASTM F-1233 Level 2.7 body passage rated`

4. TYPE: SG-2M – 13/16” Nominal Mirrored glass clad polycarbonate, Global Security Glazing SecurTem+Poly 2116 (Type SG-2 above with mirror) Note: Lighting ratio of 8:1 is required for this product.

5. TYPE: SG-3 -3/4” Nominal, clear glass clad polycarbonate, Global Security Glazing SecurTem+Poly SP-019 basis of design. ASTM F-1915 Security Grade 2 (40 min) and ASTM F-1233 body passage level 2.8 rated.

6. TYPE:SG-3M – 13/16” Nominal, mirrored glass clad polycarbonate, Global Security Glazing SecurTem+Poly ASTM F 1915-15 Security Grade 2 (40 min) and ASTM F-1233 body passage level 2.8 rated. Note: Lighting ratio of 8:1 is required for this product.

7. TYPE: SG-4 - 1" nominal, clear glass clad polycarbonate, Global Security Glazing SecurTem+Poly SP-028 basis of design. ASTM F-1915 Security Grade 1 (60 min) rated.

8. TYPE: SG-4IG Insulated glass clad polycarbonate, Global Security Glazing SecurTem+Poly SP-028M basis of design. ASTM F-1915 Security Grade 1 (60 min) rated. Include IG to match exterior commercial insulated glazing product.
.

9. TYPE: SG-FR1 – 13/16” Nominal UL Fire rated UL9 & 10B for 45 min, and ASTM F-1915 Security Grade 4 (10 min), square wire.(baroque). Max length 42” not to exceed 1296 sq inches. Install using Blazeseal tape per UL installation and mfgers instructions.

10. TYPE: SF-FR2 – 1” Nominal, UL Fire rated UL 9 & 10C for 90 min, and ASTM F-1915 Security Grade 3 (20 min), square wire, (baroque). Max length 33” not to exceed 330 sq inches. Install using Blazeseal tape per UL installation and mfger’s instructions.

END OF SECTION

SECTION 09 0561

COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to all floors identified in Contract Documents.

B. Preparation of new and existing concrete floor slabs for installation of floor coverings.

C. Testing of concrete floor slabs for moisture and alkalinity (pH).

D. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If moisture/alkalinity (pH) testing determines such remediation is not required to meet floor covering manufacturer's requirements, a contract modification will be issued to credit the project.

E. Patching compound.

F. Remedial floor coatings.

G. Preparation of new and existing wood-based floors and subfloors for installation of new floor coverings.

1.02 PRICE AND PAYMENT PROCEDURES

A. Alternate for Alternate Flooring Adhesive: Do not include the cost of the alternate adhesive in the base bid; state on the bid form the total additional cost for the alternate adhesive, installed, in the event such remediation is required.

B. Alternate for Remedial Floor Coating or Sheet Membrane: Do not include the cost of floor coating or underlayment in the base bid; state on the bid form the total additional cost for the floor coating, installed, in the event such remediation is required.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 1999 (Reapproved 2014).

C. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application; 2018.

D. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2019.

E. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

F. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.05 SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

B. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.

3. Moisture and alkalinity (pH) test reports.
4. Copies of specified test methods.
5. Recommendations for remediation of unsatisfactory surfaces.
6. Product data for recommended remedial coating.
7. Submit report to Architect.
8. Submit report not more than two business days after conclusion of testing.

C. Adhesive Bond and Compatibility Test Report.

1.06 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing will be performed by an independent testing agency employed and paid by Owner.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Owner when specified ambient conditions have been achieved and when testing will start.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
2. Products:
a. ARDEX Engineered Cements; ARDEX MC RAPID: www.ardexamericas.com/#sle.

b. Sika Corporation; Sikafloor Moisture Tolerance Epoxy Primer and Sikafloor Self-Leveling Moisture Tolerant Resurfacer: www.sikafloorusa.com/#sle.
c. UZIN UTZ NORTH AMERICA, INC; UZIN PE 460 with UZIN PE 280 and UZIN NC 170 LevelStar: https://us.uzin.com/#sle.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
b. Removal of existing floor covering.
2. Existing concrete slabs with coatings or penetrating sealers/hardeners/dustproofers:
a. Do not attempt to remove coating or penetrating material.
b. Do not abrade surface.
c. Prepare surface according to recommendations of remedial coating manufacturer and according to ASTM D4259.
3. Preliminary cleaning.
4. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
5. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
6. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
7. Specified remediation, if required.
8. Patching, smoothing, and leveling, as required.
9. Other preparation specified.
10. Adhesive bond and compatibility test.
11. Protection.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.04 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.05 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.06 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.07 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.08 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.09 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.10 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gypsum wallboard.

B. Joint treatment and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.

B. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.

C. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring; 2003 (Reapproved 2018).

D. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2018.

E. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

F. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

G. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2019.

H. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

I. GA-216 - Application and Finishing of Gypsum Panel Products; 2016, with Errata.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.02 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Gold Bond Building Products, LLC provided by National Gypsum Company: www.goldbondbuilding.com/#sle.
   3. USG Corporation: www.usg.com/#sle.

B. Impact Resistant Wallboard:
   1. Application: All locations.
   2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
   3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
   4. Soft Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.

5. Hard Body Impact: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
6. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
7. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
8. Type: Fire-resistance-rated Type X, UL or WH listed.
9. Thickness: 5/8 inch.
10. Edges: Tapered.
11. Paper-Faced Products:
    a. CertainTeed Corporation; Extreme Impact Resistant Drywall with M2Tech: www.certainteed.com/#sle.
    b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Hi-Impact Gypsum Board: www.goldbondbuilding.com/#sle.
    c. USG Corporation; Sheetrock Brand Mold Tough VHI Firecode X Panels 5/8 in. (15.9 mm): www.usg.com/#sle.

2.03 SECURITY MESH

A. Diamond Mesh Metal Lath: High-strength expanded metal mesh.
   1. Complying with ASTM F1267 & A1011, Type II, Class 1 - Carbon Steel - Mesh.
   2. Sheet Size: 48 inch x 96 inch.
   3. Basis of Design Product:
      a. ClarkDietrich; BM75.
      b. Amico Security Mesh; ASM .75-13F.
   4. Fasteners: High strength steel clip used to attach metal mesh to framing studs. Provide at 12 inches on center, 24 clips per 48 inch x 96 inch sheet, minimum.
      a. ClarkDietrich; BM-Clip.
      b. Amico Secura Clip.

2.04 GYPSUM BOARD ACCESSORIES

A. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel, unless noted otherwise.

B. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Paper Tape: 2 inch wide, creased paper tape for joints and corners.
   2. Joint Compound: Drying type, vinyl-based, ready-mixed.

C. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

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.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SECURITY MESH LATH INSTALLATION

A. Apply lath taut, with long dimension perpendicular to supports.

B. Lap or nest ends of metal lath in accordance with ASTM C841.

C. Secure end laps with tie wire where they occur between supports.

D. Attach metal lath to metal framing using steel clips at maximum 12 inches on center.

E. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.

F. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

3.03 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
   1. Exception: Tapered edges to receive joint treatment at right angles to framing.

C. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as follows:
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.05 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

3.06 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 2216
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ceiling and soffit framing.

B. Framing accessories.

1.02 REFERENCE STANDARDS

A. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

B. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

C. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2020.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich: www.clarkdietrich.com/#sle.
   2. Marino: www.marinoware.com/#sle.
   3. SCAFCO Corporation: www.scafco.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING MATERIALS

A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Runners: U shaped, sized to match studs.
   2. Ceiling Channels: C shaped.
   3. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
   4. Resilient Furring Channels: Single or double leg configuration; 1/2 inch channel depth.

B. Non-Loadbearing Framing Accessories:
   1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
   2. Fasteners: ASTM C1002 self-piercing tapping screws.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

3.02 CEILING AND SOFFIT FRAMING AND FURRING

A. Comply with requirements of ASTM C754.

B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

C. Install furring independent of walls, columns, and above-ceiling work.

D. Securely anchor hangers to structural members or embed them in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

E. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.

F. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

G. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.

H. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.

I. Laterally brace suspension system.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/8 inch in 10 feet.

B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

C. Direct attached ceiling panels.

1.02 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2017.

B. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2020.

E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2019.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical 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. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.05 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture direct sunlight, surface contamination, and other causes.

B. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.07 FIELD CONDITIONS

A. Do not install ceiling panels until building is closed in and HVAC system is operational.

B. Locate materials onsite at least 72 hours before beginning installation to allow materials to acclimate and reach temperature and moisture content equilibrium.

C. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.08 EXTRA MATERIALS

A. Furnish extra material described below that match products installed and that are packaged with protective covering for storage and identification with labels describing contents.
   1. Acoustical tiles: minimum 3% of installed product for each finish.
   2. Bottle of Paint to match acoustical panels for touch-up.

1.09 WARRANTY

A. Thirty (30) years Full System, from date of substantial completion

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. **BASIS OF DESIGN:** Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/ceilings-and-walls/#sle.
   3. USG Corporation: www.usg.com/ceilings/#sle.

2.02 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Panels: Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type III.
   2. Size: 24 by 24 inches.
   3. Thickness: 3/4 inch.
   4. NRC Range:.90 to 100, determined in accordance with ASTM E1264.
   5. Panel Edge: Square. Lay-In.
   6. Color: White.
   7. Suspension System: Exposed grid.
   8. Products:
      a. **BASIS OF DESIGN:** Armstrong World Industries, Inc; Optima Lay-In: www.armstrongceilings.com/#sle.
      b. CertainTeed Corporation: www.certainteed.com/ceilings-and-walls/#sle.
      c. USG Corporation: www.usg.com/ceilings/#sle.

C. Wood Fiber Acoustical Panels: Cementitious wood fiber bonded with inorganic hydraulic cement, direct mount ceiling installation with security screws.
   1. Flame Spread Classification: ASTM E1264, Class A.
   2. Size: 24 by 48 inches.
   3. Thickness: 2 inches.
   4. Panel Edge: Square.
   5. Surface Pattern: Coarse.
   6. Surface Finish: Factory-applied latex paint with silicate surface coating for abuse resistance.
   7. Surface Color: White.
   8. Products:
      a. **BASIS OF DESIGN:** Armstrong World Industries, Inc; Tectum Direct-Attach: www.armstrongceilings.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

B. Exposed Suspension System: Hot-dipped galvanized steel grid with steel cap.
   1. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
   2. Profile: Tee; 15/16 inch face width.
   3. Finish: Baked enamel.
   4. Color: White.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.

E. Perimeter Moldings: Same metal and finish as grid.
   1. Size: As required for installation conditions and specified Seismic Design Category.
   2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.

F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

C. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer’s printed recommendations.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

C. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

D. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering, painting, etc. has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Grid to be supported from structural members.

C. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

E. Locate system on room axis according to reflected plan.

F. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

G. Hanger wires shall be installed as nearly vertical as possible. If an obstruction (such as ductwork) interferes with spacing, a "trapeze" shall be used. Wires shall not be supported from ductwork, conduit, or piping, only the building structure. Both ends of hanger wires shall be tightly wrapped with a minimum of three twists.

H. 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.

I. Anchors for hanger wires in a concrete deck shall be drilled-in, wedge type expansion anchors only. Powder-actuated fasteners shall not be used except in concrete on metal decking or structural steel framing members.

J. Install hanger wire as required with necessary on center spacing to support expected ceiling load requirements, following local practices, codes and regulations. Provide additional wires at light fixtures, grilles, and access doors where necessary. A pigtail knot shall be used with three tight wraps at top and bottom fastening locations.

K. All hanger wires shall be spaced no more than 48 inches apart in any direction. Extra wires shall be provided near light fixtures, so that a wire supports each corner of the fixture.

L. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

M. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

N. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. For mounting Tectum® Direct-Attached Ceiling Panels, see drawings.

C. Replace damaged and broken Tectum® Direct-Attached Ceiling Panels.

D. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer’s instructions for cleaning and touch up of minor finish damage. Remove any Tectum® Direct-Attached Ceiling Panels that cannot be successfully cleaned and or repaired. Replace with new product to eliminate evidence of damage.

E. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

F. Fit border trim neatly against abutting surfaces.

G. Install units after above-ceiling work is complete.

H. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

I. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.

J. Where round obstructions occur, provide preformed closures to match perimeter molding.

K. Install hold-down clips on panels within 20 ft of an exterior door.

3.05 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove any panels that cannot be successfully cleaned or repaired, and replace with new product to eliminate evidence of damage.

3.06 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

SECTION 09 5421
METAL PAN CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal pan ceilings.

B. Suspended metal support system and perimeter trim.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2017.

B. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

E. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2020.

F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate work of this section with installation of mechanical and electrical components and with other construction activities affected by work of this section.

B. Preinstallation Meeting: Convene one week before starting work of this section.

C. Sequencing: Supply hanger clips during steel deck erection. Supply additional hangers and inserts as required.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Furnish for component profiles, materials, perimeter and integral trim, and space closures.

C. Shop Drawings: Indicate reflected ceiling plan.

D. Installer's qualification statement.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.
   2. Extra Metal Panels: One, standard dimensions.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept factory-finished products on site in manufacturer's unopened factory packaging; reject opened packages.

B. Protect factory-finished products from damage by storing in manufacturer's unopened factory packaging in dry storage area.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 1-year manufacturer warranty; include coverage for corrosion resistance and discoloration of surface finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Pan Ceilings:
   1. **BASIS OF DESIGN:** Armstrong World Industries, Inc; Metalworks Torsion Spring - M18: www.armstrongceilings.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/ceilings-and-walls/#sle.
   3. USG Corporation: www.usg.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

A. Design to support imposed loads of indicated elements without eccentric loading of supports. Where supported elements may induce rotation of ceiling system components, provide stabilizing reinforcement.

B. Design for maximum deflection of 1/360 of span.

C. Surface Burning Characteristics: Class A: Flame spread index of 25 or less, smoke developed index of 50 or less, when tested in accordance with ASTM E84.

D. Noise Reduction Coefficient (NRC):.85, measured in accordance with ASTM C423 with insulation installed.

2.03 METAL PAN CEILING ASSEMBLIES

A. Metal Pan Ceiling System: Panels, suspension members, trim, and accessories as required to provide a complete system.
   1. Exposed fasteners are not permitted.

B. Torsion Spring Downward Access Panels: Metal-faced, prefinished panels with hinges and heavy-duty torsion springs for insertion into slots in suspension system, and allowing downward access without damaging panel face or hinge assembly.
   1. Classification: ASTM E1264, Class A, Type V, perforated, galvanized steel formed sheet.
   2. Panel Size: As indicated on drawings.
   3. NRC Range:.85 to.90, determined in accordance with ASTM E1264.
   4. Finish: Painted.
      a. Color: White.
   5. Accessories: Provide manufacturer's standard edge trim and spacers.

C. Metal Panel Accessories
   1. **BASIS OF DESIGN:** Armstrong 8200T10 - 1" Fiberglass Infill Panel (in poly bag)

2.04 SUSPENSION SYSTEM

A. Metal Suspension Systems - General: Comply with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
   1. Product:
      a. **BASIS OF DESIGN:** Armstrong Metalworks SecureLock Lay-n & Screw-in: P4 Perforation: www.armstrongceilings.com/#sle.
   2. Electrogalvanized Steel - Thickness 18-gauge, ASTM E84 Class A. Flame Spread Index 25 or less and Smoke Developed Index 50 or less.
   3. Point-load tested to withstand up to 850 lbs, and a minimum of 430 lbs.
   4. Concealed locking.
   5. Product to be installed on heavy-duty Prelude XL suspension system.
      a. **BASIS OF DESIGN:** Armstrong Prelude Heavy-Duty XL Suspension System: www.armstrongceilings.com/#sle.

6. Color: White

B. Metal Panel Accessories
   1. **BASIS OF DESIGN:** Armstrong 8200T10 - 1" Fiberglass Infill Panel (in poly bag)

2.05 ACCESSORIES

A. Sound-Absorptive Backer: Manufacturer's standard material, installed to backside of perforated panels in sufficient thickness to achieve specified NRC rating for panels.
   1. Thickness, Density, and Acoustical Performance: 1 inch thick with NRC .75.

B. End Caps: Formed metal; same color and finish as sight-exposed surfaces of metal panels.

C. Metal Panel Accessories
   1. **BASIS OF DESIGN:** Armstrong 8200T10 - 1" Fiberglass Infill Panel (in poly bag)

2.06 FABRICATION

A. Shop cut metal panels to accommodate mechanical and electrical items.

B. Factory-form internal and external corners of same material, thickness, finish, and profile to match exposed metal panels; back brace internal corners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

C. Verify that field measurements are as indicated on shop drawings.

D. Start of installation constitutes acceptance of project conditions.

3.02 PREPARATION

A. Coordinate the location of hangers with other work.

B. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

C. Install after major above-ceiling work is complete.

3.03 INSTALLATION - SUSPENSION SYSTEM:

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented by this section.

B. Install hangers and inserts coordinated with overhead work. Provide additional hangers and supports as required.

C. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

D. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

E. Suspension System, Nonseismic: 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.

F. Where ducts, facility services, or equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

J. Edge Moldings: Install at intersection of ceiling and vertical surfaces and penetrations, using components of maximum length, set level.

1. Use longest practical lengths.

3.04 INSTALLATION - METAL PANS

A. Install panels, baffles, and other system components in accordance with manufacturer's instructions.

B. Butt interior end joints tight.

C. Provide expansion joints to accommodate plus or minus 1 inch movement and maintain visual closure.

D. Install edge moldings at junctions with other finishes and at vertical surfaces; use maximum piece lengths.

E. Install end caps at sight-exposed ends of panels.

F. Exercise care when site cutting sight-exposed finished components to ensure surface finish is not defaced.

3.05 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.

C. Maximum Variation From Dimensioned Position: 1/4 inch.

3.06 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

C. Replace damaged or abraded components.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 0561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems: Grounding and bonding of static control flooring to building grounding system.

1.03 REFERENCE STANDARDS

A. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2020.

B. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Verification Samples: Submit two samples, 6 by 6 inch in size illustrating color and pattern for each resilient flooring product specified.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 5 square feet of each type and color.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

1.07 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Tile: Printed film type, with transparent or translucent wear layer; acoustic interlayer or backing.

1. Manufacturers:
    a. **BASIS OF DESIGN:** Mannington Commercial: www.manningtoncommercial.com#sle.
2. Minimum Requirements: Comply with ASTM F1700, Class III.
3. Plank Tile Size: 6 by 48 inch.
4. Wear Layer Thickness: Min. 40 mils.

2.02 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; style as scheduled.
1. Manufacturers:
    a. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
    b. Mannington Commercial: www.manningtoncommercial.com#sle.
    c. Roppe Corporation: www.roppe.com/#sle.
2. Height: 4 inch.
3. Thickness: 0.125 inch.
4. Finish: Satin.
5. Color: To be selected by Architect from manufacturer's full range.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Moldings, Transition and Edge Strips: Metal.
1. Manufacturers:
    a. Schluter: www.schluter.com.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
1. Test in accordance with Section 09 0561.
2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
3. Follow moisture and alkalinity remediation procedures in Section 09 0561.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

D. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
1. Place copper grounding strip in conductive adhesive and apply additional adhesive to top side of strip before installing static control flooring. Allow strip to extend beyond flooring in

accordance with static control flooring manufacturer's instructions. Refer to Section 26 0526 for grounding and bonding to building grounding system.

2. Fit joints and butt seams tightly.
3. Set flooring in place, press with heavy roller to attain full adhesion.

D. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
   1. Metal Strips: Attach to substrate before installation of flooring using stainless steel screws.

E. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 6700
FLUID-APPLIED FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid-applied flooring on exposed concrete floors and integral formed cove base.
   1. Additional striping

B. Fluid-applied flooring on exposed concrete floors.

1.02 REFERENCE STANDARDS

A. ASTM C307 - Test Method for Tensile Strength of Chemical-Resistant Mortars.

B. ASTM C501 - Test Method for Relative Resistance to Wear Unglazed Ceramic Tile by the Taber Abraser.

C. ASTM C531 - Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing.

D. ASTM C579 - Test Methods for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfaces.

E. ASTM C580 - Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing.

F. ASTM C884 - Test Method for Thermal Compatibility Between Concrete and an Epoxy Resin Overlay.

G. ASTM D522 - Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.

H. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2018).

I. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2015.

J. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

K. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser; 2019.

L. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.

M. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.

C. Shop Drawings: Show installation of cove base, termination details, and details at floor material transitions and where adjoining equipment.
   1. Locate and provide written detailing of treatment for all types of concrete substrate joints and repair of cracks required for flooring in area of installation.

D. Samples: Submit three standard size cured samples illustrating color, pattern, and finish properties for each floor material. Approved samples will be used during installation for product match.

E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and application rate for each coat.
   1. Submit descriptive data and specific recommendations for mixing, application, curing including any precautions of special handling instructions required to comply with the Occupational Safety and Health Act.

F. Certified Test: Submit two copies of supplier's/manufacturer's written certification that flooring system meets or exceeds required properties.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Top Coat Materials: 2 gallons.

1.04 QUALITY ASSURANCE

A. Materials used in the floor surfacing shall be the products of a single manufacturer.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

C. Applicator Qualifications: Company specializing in performing the work of this section.
   1. Minimum 3 years of documented experience.
   2. Approved by manufacturer.
   3. The general contractor shall furnish a written statement from the manufacturer that the installer is acceptable.

D. General Contractor to verify locations of all joints required by the provisions of this Section and Section 03 3000 Cast-In-Place-Concrete and by the recommendations of the related material manufacturers.
   1. Joint locations may or may not be shown in drawings.
   2. Refer to drawings required under submittals above.

E. Installer to keep daily log of the date of installation, room number, type, color, and method of application of product being installed. Log must be available for inspection by the Architect upon request.

F. Installer must have proven experience or training approved by flooring system manufacturer with specified system.

1.05 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.
   1. Number of Mock-Ups to be Prepared: One.
   2. Use same materials and methods for use in the work.
   3. Use approved design samples as basis for mock-ups.
   4. Locate where directed.
   5. Minimum Size: 48 inches by 48 inches.

C. See Section 01 4000 - Quality Requirements for additional requirements.

D. Obtain approval of mock-up by Architect before proceeding with work.

E. Approved mock-up may remain as part of the work.

F. Unacceptable installed work to be removed and replaced until acceptable. Aesthetically unacceptable but well bonded work may be overlaid or recoated if thickness clearances permit.

1.06 DELIVERY, STORAGE, AND HANDLING

A. All materials shall be delivered to project site in original manufacturer's sealed containers including type of material, batch numbers, date of manufacture, and pertinent labels intact and legible.

B. Store resin materials in a dry, secure area in original manufacturer's sealed containers including type of material, batch numbers, date of manufacture, and pertinent labels intact and legible.

C. Store materials for three days prior to installation in area of installation to achieve temperature stability.

D. Follow all manufacturer's specific instructions and prudent safety practices for storage and handling.

1.07 FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F.

B. Store materials in area of installation for minimum period of 24 hours prior to installation.

C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials. Concrete to receive surfacing shall have cured for at least 28 days and shall have been free of water for at least 7 days.

D. Dew Point: Substrate temperature must be minimum of 5 degrees above dew point prior to, during or up to 24 hours after application of flooring system.

E. Illumination: Apply flooring system only where a minimum of 30 footcandles exist when measured 3 feet from surface.

F. **Advise other trades of fixtures and fittings not to be installed until flooring is cured and protected.**

1.08 PROTECTION

A. Protect adjacent surfaces not scheduled to receive the flooring by masking, or by other means, to maintain these surfaces free of the flooring material.

B. Provide adequate ventilation and fire protection at all mixing and placing operations. Prohibit smoking or use of spark or flame producing devices within 50 feet of any mixing or placing operation.

C. Provide polyethylene or rubber gloves or protective creams for all workmen engaged in applying products.

1.09 WARRANTY

A. Contractor to guarantee work under this Section to be free from defects of material and installation for the duration of the warranty period. Defects occurring during warranty period shall be repaired, in a manner satisfactory to the Owner and the Architect, at no additional cost to the Owner.
   1. Warranty Period: One (1) Year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Resinous Fluid-Applied Flooring:
   1. **BASIS OF DESIGN:** Key Resin Company; Key Urecon Chip 100: www.keyresin.com/#sle.
   2. Dur-a-Flex: www.dur-a-flex.com
   3. Sika Corporation: www.sikafloorusa.com/#sle.

B. Fluid-Applied Flooring (Concrete Sealant):
   1. **BASIS OF DESIGN:** Key Resin Company: Key Epoglaze: www.keyresin.com.
   2. Dur-a-Flex: www.dur-a-flex.com
   3. Sika Corporation: www.sikafloorusa.com/#sle.

2.02 FLUID-APPLIED FLOORING SYSTEMS

A. Resinous Fluid-Applied Flooring: Heavy duty three-component urethane resin modified cementitious topping, with epoxy grout coat and broadcast aggregate, and sealed with light resistant clear epoxy and aliphatic urethane.
   1. Aggregate: Vinyl flakes.
   2. System Thickness: 1/4 inch, nominal, dry film thickness (DFT).
   3. Texture: Slip resistant.
   4. Sheen: Gloss.
   5. Color: As selected by Architect.
   6. Provide 4 inch integral coved base.

7. Testing Requirements (minimum):

Flexural Strength (ASTM C-580)	2600 psi
Tensile Strength (ASTM C-307)	1100 psi
Compressive Strength (ASTM C-579, 7 days)	7500 psi
Coefficient of Thermal Expansion (ASTM C-531)	2 x 10-5 per ºF
Density	125-130 lbs/ft3
Flammability (ASTM-D-635)	Self Extinguishing
Bond Strength (ACI COMM #403/#503)	100% concrete failure minimum, with 300+ psi minimum tensile strength
Fungus & Bacteria Growth (MIL-F-52505)	Will not support growth
Hardness (ASTM D-2240)	80-85 Shore D
Thermal Shock Resistance (ASTM C-884)	Passes
Impact Resistance (MIL-D-3134F)	Withstands 16 ft./lbs. without cracking, delamination or chipping
Chemical Resistance (ASTM-D-1308)	Excellent chemical resistance to a variety of strong chemicals including acids, alkali, and solvents. Consult Key Resin Company for details on chemical resistance of specified topcoat.

8. **BASIS OF DESIGN:** Key Resin Company; Key Urecon Chip 100 System: www.keyresin.com/#sle.
   a. Mixing: Key Urecon Chip 100 is supplied as a multiple product component system consisting of reactive urethane resin, selected fillers and aggregates, two component epoxy and urethane resins, plastic chips (flake). All two and three component materials are thoroughly blended before application.

B. Final Coat: Fluid-Applied Flooring: Polyaspartic aliphatic polyurea resin; clear.
   1. **BASIS OF DESIGN:** Key Resin: Key 470 Polyaspartic Coating: www.keyresin.com.

C. Accent Striping: Fluid-Applied Flooring: Polyaspartic aliphatic polyurea resin; solid color.
   1. **BASIS OF DESIGN:** Key Resin: Key 470 Polyaspartic Coating: www.keyresin.com.

D. Fluid-Applied Flooring (Concrete Sealant): Epoxy, without aggregate. Breathable, water based for direct application to concrete.
   1. VOC: <50 g/L.
   2. System Thickness: 8 mils, nominal, when dry.
   3. Texture: Smooth.
   4. Sheen: Satin gloss.
   5. Color: As selected by Architect (PSC).
   6. **BASIS OF DESIGN:** Key Resin Company: Key Epoglaze: www.keyresin.com

2.03 ACCESSORIES

A. Fillet Strips: Per manufacturers recommendation.

B. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.

C. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect surfaces to receive flooring and verify that condition is smooth and free from conditions that will adversely affect execution, permanence or quality of work.
   1. Remove all projections, all debris detrimental to flooring system, dirt, oil contaminates, grease and surface coatings affecting bond.

B. **Notify Architect in writing prior to commencing work of any conditions deemed unsatisfactory for the installation; installation of flooring materials is understood as acceptance of the substrate as satisfactory.**

C. Concrete: The General Contractor shall be responsible for hiring an independent testing service to test for moisture content and moisture vapor emission rate; install no flooring over concrete until the concrete has been cured and is sufficiently dry to achieve permanence with flooring as determined by material manufacturer's recommended bond and moisture tests.
   1. Effectively remove concrete laitance by steel shot blasting or other method approved by flooring manufacturer. Surface profile must be a minimum CSP-3 profile according to International Concrete Repair Institute Guideline #03732.
   2. Concrete slab shall have an efficient moisture vapor barrier directly under the concrete slab (for slab on grade). Testing must be done to verify that the moisture vapor emission rate of the slab does not exceed that as recommended by the manufacturer at time of installation of the flooring or at any future date. Moisture vapor emission and moisture content testing must conform with the requirements of ASTM F-1869-98 (Calcium Chloride Test) and ASTM F-2170-02 (Relative Humidity Probe Test). If test results show excessive levels of moisture content or vapor emission rate, installation shall not proceed until source of excessive moisture is identified and removed or corrected. If excessive moisture cannot be removed or prevented, apply manufacturer’s recommended moisture vapor emission control material.
   3. Treat cracks in concrete using manufacturer's recommended practice. Rout out crack and fill with flooring base coat material. Do not coat surface with flexible crack isolation membrane treatment.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 09 0561.
   2. Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.

3.02 PREPARATION

A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

B. Prepare concrete surfaces according to ICRI 310.2R.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.

D. Vacuum clean substrate.

E. Apply primer to surfaces required by flooring manufacturer.

F. Verify concrete in the showers is properly pitched towards the drains.

3.03 INSTALLATION - ACCESSORIES

A. Install fillet strips at base of walls where flooring is to be extended up wall as base.

3.04 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.

B. Route out all cracks (larger than 1/32 inch width) and fill with urethane resin material. All free edges (perimeters, along gutters/trenches, cove base or drains) require extra anchor to distribute mechanical and thermal stresses. All control joints, expansion joints and cold joints should be exposed through the system whenever possible. Control joints (contraction joints) may be filled with urethane resin or rigid epoxy, reinforced with fiberglass cloth and overlaid with flooring system if potential for future crack development is accepted by Owner.

C. Apply each coat to minimum thickness required by manufacturer.

D. Finish to smooth dense level surface.

E. Shower Room: Build an epoxy berm out of epoxy mortor 1/2" high and 6" wide to keep water out of the drying area. See drawings for the location of the berm. Sloping up to the berm to be minimum 1/8 inch per ft minimum.

F. Integral Cove Base: Provide integral cove base formed from flooring up concrete block wall or cement board if gypsum drywall is specified. Provide cove base cap strip at top of base as recommended by flooring manufacturer and trowel material up wall to form smooth, integral transition and base 4 inches high unless otherwise indicated or scheduled.

G. Key in to concrete minimum 1/8 inch wide by 1/4 inch deep sawcut to create smooth transitions for epoxy flooring around drains and termination points.

H. **Striping: Within 24 hours after final topcoat has been applied and has cured, tape off locations for the stripes and install pigmented polyaspartic aliphatic coating. If the product has not been installed within that 24 hour period, the contractor must lightly sand strip area and solvent wipe for proper adhesion of the pigmented polyaspartic aliphatic coating.**

I. Maintaining a wet edge between mixes, push material back into previous mix and pull forward with trowel or gauge rake to establish thickness. Broadcast to excess with silica sand. Allow to cure 8 hours at room temperature (70 degrees F). If necessary, sand/grind surface to remove excess texture, trowel marks, etc. Apply epoxy at recommended coverage rate and broadcast colored chips to match approved sample. Allow to cure.

J. Seal surface with recommended topcoat(s). Allow proper cure time for the particular topcoat used.

K. Match finished work to approved sample; uniform in thickness, color, texture and free from significant defects detrimental to appearance.

L. Apply temporary protection until floor is fully cured. The General Contractor shall protect the finished floor from the time that the sub-contractor completes the work.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

3.06 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Barricade area to protect flooring until fully cured.

END OF SECTION

SECTION 09 7730

SANITARY WALL AND CEILING FINISH SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Epoxy elastomeric wall finish system.
   1. Furnish all necessary materials, labor and equipment required to prepare substrate and install EPOXY AND URETHANE FLAKE WALL SYSTEM.

1.02 REFERENCE STANDARDS

A. ACI 503R - Use of Epoxy Compounds with Concrete.

B. ASTM C884 - Standard Test Method for Thermal Compatibility Between Concrete and an Epoxy-Resin Overlay.

C. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2018.

D. ASTM D2240 - Standard Test Method for Rubber Property—Durometer Hardness.

E. ASTM D2794-84 - Standard Guide for Testing High-Performance Interior Architectural Wall Coatings.

F. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating matrix materials and physical and performance characteristics.

C. Shop Drawings: Indicate dimensions, locations of edging, divider and control joints, and panel layout.

D. Samples: Submit two samples, 6 x 6 inch in size illustrating color of matrix, color of aggregate, and clear protective overcoat.

E. Manufacturer's Instructions: Indicate special procedures.

F. Maintenance Data: Include maintenance and cleaning requirements for coatings, stain and graffiti removal, rejuvenation of top coat, repair and patching techniques.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Matrix Material: 1 gallon of each color specified.

1.04 QUALITY ASSURANCE

A. Products Requiring Flame/Smoke Ratings: Classified and listed by UL.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience. Obtain system materials from a single manufacturer providing materials of the type specified in this section.
   1. Obtain primary Epoxy/Urethane Wall Flake Coating System materials including primers, resins, hardening agents, specially blended aggregates, and finish coats from a single manufacturer providing materials of the type specified in this section. Provide unblended aggregates, solvents and other secondary materials from a source recommended by the manufacturer of primary materials.
   2. Installer to verify locations of all joints requiring a soft sealant and/or epoxy joint material. Follow recommendations of material manufacture for treatment of all joints, expansion joints, and cracks.

C. Applicator Qualifications: Company specializing in performing the work of this section. Installation shall be performed by a contractor with skilled mechanics having not less than 3 years of satisfactory experience in the application of the type of system as specified in this section and shall be approved by the manufacturer of the Epoxy/Urethane Coating System.

D. Installer must be acceptable to architect, manufacturer, and owner.

1.05 WARRANTY

A. The contractor shall furnish a standard maintenance guarantee of the Epoxy Elastomeric Wall Finish System for a period of 1 year after installation, and includes loss of bond and top-side degradation due to normal use.

1.06 MOCK-UP

A. Portable mock-up: Prior to starting application of coating system, provide full scale portable mock-up to establish acceptable quality, durability, and appearance. Mock-up size must not be less than 4 square feet.
   1. Acceptable mock-up to be standard of quality for installed work.
   2. Unacceptable installed work to be removed and replaced until acceptable. Aesthetically unacceptable but well bonded work may be recoated per Manufacturer's instructions if thickness clearances permit.

1.07 MATERIAL DELIVERY, HANDLING, AND STORAGE

A. Primary system materials shall be delivered in the manufacturer's undamaged, unopened containers. Each container shall be clearly marked with the following: product name, manufacturer's name, component designation, and ratio of component mixture.

B. Provide equipment and personnel to handle the materials by methods with prevent damage.

C. The applicator shall promptly inspect all direct job-site deliveries to assure that quantities are correct and that materials comply with requirements and are not damaged.

D. Store materials in accordance with manufacturer's instructions, with seals and labels intact and legible. Maintain temperatures within the required range. Do not use materials which have been stored for a longer period of time than the manufacturer's maximum recommended shelf life.

1.08 FIELD CONDITIONS

A. The applicator should exercise care during surface preparation and system application to protect surrounding substrates and surfaces, as well as in-place equipment. The applicator shall use his discretion as to the physical means and methods used for preparation and protection. Any costs incurred for resultant damage from negligence or inadequate protection shall be the sole responsibility of the applicator.

B. Maintain the ambient room and the floor temperatures at 60 degrees Fahrenheit, or above, for a period extending from 72 hours before, during and after floor installation. Concrete to receive surfacing shall have cured for at least 28 days and shall have been free of water for at least 7 days.

C. Dew Point: Substrate temperature must be minimum of 5 degrees above dew point prior to, during or up to 24 hours after application of flooring system.

D. Illumination: Apply flooring system only where a minimum of 30 footcandles exist when measured 3 feet from surface.

E. During material application, care should be exercised to comply with the temperature and humidity limitations of the materials used as defined by the manufacturer.

F. Provide temporary enclosures, heat, and ventilation in areas where work is being performed, to allow work to cure.

G. Advise other trades of fixtures and fittings not to be installed until flooring is cured and protected.

1.09 PROTECTION

A. Protect adjacent surfaces not scheduled to receive the flooring by masking, or by other means, to maintain these surfaces free of the flooring material.

B. Provide adequate ventilation and fire protection at all mixing and placing operations. Prohibit smoking or use of spark or flame producing devices within 50 feet of any mixing or placing operation.

C. Provide polyethylene or rubber gloves or protective creams for all workmen engaged in applying products containing epoxy.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aggregate Wall Surfacing:
   1. **BASIS OF DESIGN:** Key Resin Company: www.keyresin.com/#sle.
      a. Key Chip 100 Wall Flake System, Shall be Commercial Block Filler, Key 513 Pigmented Flake receiving Coat, Broadcast Flakes, Then (2) Clear Coats of Key 513 Clear and a Final Finish Coat of 470 Polyaspartic Clear Finish.
   2. Dur-A-Flex: www.dur-a-flex.com
   3. Sika Corporation: www.sikafloorusa.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Key Chip 100 Wall Flake System, Shall be Commercial Block Filler, Key 513 Pigmented Flake receiving Coat, Broadcast Flakes, Then (2) Clear Coats of Key 513 Clear and a Final Finish Coat of 470 Polyaspartic Clear Finish.
   1. Epoxy or Polymeric Block Filler: Epoxy block filler or polymeric block filler as required by manufacturer. Acrylic latex block fillers are not acceptable.
   2. Epoxy Primer to be used in areas where Block Filler is NOT used.

B. Prior to system application, all control joints and cracks are to be treated with semi-rigid epoxy joint filler and rigid epoxy crack filler respectively as described in the execution section.

C. The finished wall system shall be a minimum 35-40 mils in thickness, dense, nonporous and have a gloss finish matching approved sample.

2.03 ACCESSORIES

A. Corner Beads, Casing Beads and Base Screeds: Minimum 26 gauge, 0.0179 inch thick, steel with galvanized coating, of longest practical lengths; sizes and profiles for application; square casing bead.

B. Control Joints: Back-to-back casing beads; same material as corner and casing beads.

C. Primer and Filler Base: As recommended by surfacing material manufacturer for specific substrate surface.

PART 3 EXECUTION

3.01 EXAMINATION

A. Obtain Architect's approval of mock-up before installing flooring; see QUALITY ASSURANCE in PART 1.

B. Verify that substrate surfaces are ready to receive work of this section, as instructed by the coating manufacturer.
   1. Inspect surfaces to receive flooring and verify that condition is smooth and free from conditions that will adversely affect execution, permanence, or quality of work.
      a. Remove all projections, all debris detrimental to flooring system, and dirt, oil contaminates, grease, and surface coatings affecting bond.

C. Verify maximum variation from flat surface of substrate is 1/8 inch.

D. Verify masonry joints are struck flush.

E. Notify Architect in writing prior to commencing work of any conditions deemed unsatisfactory for the installation; installation of flooring materials is understood as acceptance of the substrate as satisfactory.

3.02 PREPARATION

A. Prepare substrate to provide clean surface with open pores removing all contaminating or bond breaking substances including but not limited to dust, laitance, curing compounds, coatings, form release agents, sealers, oil, and grease. All spalled or deteriorated areas should be mechanically removed by chipping hammers. Level any surface projections and mortar spatters by grinding, stoning, or scraping. Rake mortar joints clean.

B. Clean surfaces of loose foreign matter.

C. Mask and protect adjacent surfaces and materials not receiving surfacing from over spray; repair damage.

D. Apply masonry filler to concrete substrates in accordance with manufacturer's instructions; to a minimum thickness of 30 mils.

E. Apply primer to all surfaces.

3.03 INSTALLATION

A. Apply each component of the Epoxy Elastomeric Wall Finish System in compliance with manufacturer's instructions including mixing and application methods, recoat windows, cure times and environmental restrictions.
   1. Apply primer to all substrates which have not been coated with an Epoxy Block Filler.
   2. Apply commercial block filler at a rate of 60-80sf/gallon on all wall areas.
   3. Apply Key 513 pigmented epoxy flake receiving coat, and blow/spread flakes into wet wall coating
   4. Apply clear Key 513 epoxy to above dry flakes, at rate of 100-125sf/mixed gallon.
   5. Apply second clear Key 513 coat to above walls, to create smooth finish.
   6. Apply final clear topcoat of Key 470 Polyaspartic coat, at rate of 200-250sf/gallon.

B. Apply block filler. Spread thoroughly blended block filler over the substrate with a flat steel trowel at the rate required to fill irregularities and mortar joints, and create a smooth sub-surface for epoxy wall system. Multiple coats may be required to achieve proper finish. Follow recommend cure time between coats and before applying Epoxy Elastomeric Wall Finish System components.

C. Place metal accessories to lines and levels.

D. Install control joints at maximum 12 ft centers. Divide areas into panels not exceeding 125 sq ft in area.

E. Cove Strips: Install preformed vinyl cove strips at all inside corners with appropriate contact cement.

F. Wall Surfacing: Apply matrix, aggregate, and overcoat in accordance with manufacturer's instructions.
   1. Apply binder to a minimum thickness of 3/16 inch.
   2. Spray apply aggregate evenly, embedding into matrix to ensure bond. Allow binder to set.
   3. Vacuum clean surface.
   4. Brush apply overcoat.

G. Sand any imperfections in the flexible epoxy base coats to achieve a smooth uniform base.

H. Apply Epoxy and Urethane Finish Coats.

I. Obtain Architect’s/Owner’s approval of the system just after completion of the final coat, prior to completion of curing.

3.04 CURING AND PROTECTION

A. Cure High-Build Epoxy/Urethane Coating System materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of the application and prior to completion of the curing process.

B. Apply temporary protection until floor is fully cured. The General Contractor shall protect the finished floor from the time that the sub-contractor completes the work.

3.05 CLEANING

A. Clean surfaces of overspray, splatter, excess material.

B. Cure all Epoxy Elastomeric Wall Finish System materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of the application and prior to completion of the curing process.

C. Apply temporary protection until Epoxy Elastomeric Wall Finish System is fully cured. The General Contractor shall protect the finished Wall System from the time that the sub-contractor completes the work.

END OF SECTION

SECTION 09 9113
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Glass.
   6. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. SCAQMD 1113 - Architectural Coatings; 1977 (Amended 2016).

C. SSPC V1 (PM1) - Good Painting Practice: Painting Manual, Volume 1; 2016.

D. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual, Volume 2; 2015.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

G. SSPC-SP 3 - Power Tool Cleaning; 2018.

H. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. Supply each paint material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
      b. SCAQMD 1113 Rule.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.
   2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
   3. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint MgE-OP-3A - Heavy Duty Door/Trim (Exterior Doors) Galvanized Metals, Alkyd, 3 Coat:
   1. Heavy duty applications include doors and door frames.
   2. One coat galvanize primer.
   3. High Performance Architectural Exterior.
   4. Products:
      a. **BASIS OF DESIGN:** Sherwin Williams: Pro Industrial Waterbased Alkyd Urethane Enamel Semi-Gloss: www.sherwin-williams.com.
         1) Product Type: Acrylic
         2) Volume Solids: Minimum 32%
         3) Wet Film Thickness: Minimum 4.0 Mils.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 INSTALLERS

A. Engage an experienced Contractor who has completed paint or coating applications similar in material, design, and extent to that indicated for the Project that have resulted in construction with a record of successful in-service performance. Experienced craftsmen shall apply all paints and coatings.

3.02 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

3.03 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

3.04 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

END OF SECTION

SECTION 09 9123
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Moving/movable equipment parts.
   6. Flexible ventilation duct connections.
   7. Flexible hose/pipe connectors.
   8. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, an d lead items.
   9. Galvanized steel surfaces/components (unless special surface preparation is accomplished prior to painting to ensure long term bonding).
   10. Equipment identification labels/name plates.
   11. Equipment performance/rating information labels.
   12. Code required/code identification labels.
   13. Floors, unless specifically indicated.
   14. Glass.
   15. Concealed pipes, ducts, and conduits.

1.02 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.
   1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured an 85 degree meter.
   2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60 degree meter.
   3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60 degree meter.
   4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60 degree meter.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2005 (Reapproved 2017).

D. SCAQMD 1113 - Architectural Coatings; 1977 (Amended 2016).

E. SSPC V1 (PM1) - Good Painting Practice: Painting Manual, Volume 1; 2016.

F. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual, Volume 2; 2015.

G. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

H. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

I. SSPC-SP 3 - Power Tool Cleaning; 2018.

J. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements , for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   3. Manufacturer's installation instructions.

C. Samples: Submit two paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

D. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience and approved by manufacturer.

1.06 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. 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 specified.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq ft.
      b. Other Items: Architect will designate items or areas required.

C. Final approval of quality level of finish product will be based on mockups.

D. Approval of mockups does not constitute approval of deviations from the Contract in writing.

E. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 EXTRA MATERIALS

A. The installing Contractor shall supply to the Using agency an extra 1 gallon of each paint product used for future touch-up purposes. All paint materials and colors shall be clearly identified.

B. At the completion of the project a schedule listing each space with manufacturer, product, color and sheen shall be provided as part of the O&M manual. Colors shall not be identified by name (such as Midnight Blue) but shall be identified by formula.

1.09 WARRANTY

A. Interior Paints & Coatings: Shall be warranted min. 5 years.

1.10 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. All paints and coatings shall be *Architectural Grade* as opposed to *Contractor Grade.*

B. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

C. Paints:
   1. Benjamin Moore & Co.: www.benjaminmoore.com.
   2. PPG Paints: www.ppgpaints.com/#sle.
   3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
   4. Supply each paint material in quantity required to complete entire project's work from a single production run.
   5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.

b. SCAQMD 1113 Rule.

2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.
2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
3. Extend colors to surface edges; colors may change at any edge as directed by Architect.
4. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.
5. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme indicated.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete masonry units, shop primed steel, and galvanized steel.
1. Two top coats and one coat primer.
2. Top Coat(s): High Performance Architectural Interior .
3. Products:
a. **BASIS OF DESIGN**: PB73W361 Pro Industrial Waterbased Catalyzed Epoxy - Eg-Shel: www.sherwin-williams.com.
4. Product Type: Waterbased Polyamine Two Component Epoxy
5. Volume Solids: Minimum 41%
6. Wet Film thickness: Minimum 5.0 Mils to 9.0 Mils.
a. Showers Walls and Ceilings: High Performance Architectural Interior.
1) Products:
(a) **BASIS OF DESIGN:** Sherwin Williams: Pro Industrial High Performance Epoxy B67-200 Series: www.sherwin-williams.com.
2) Product Type: High Solids, Two-Package Epoxy Polyamine
3) Volume Solids: Minimum 74 +/- 2%
4) Wet Film Thickness: Minimum 5.0-10.0 Mils
b. Ceilings & Overhead Surfaces Top Coat(s): High Performance Architectural Interior.
1) Products:
(a) **BASIS OF DESIGN:** Sherwin Williams: ProMar 200 Zero VOC Interior Latex, Flat, B30-2600 Series: www.sherwin-williams.com.
2) Product Type: Vinyl Acrylic Latex
3) Volume Solids: Minimum 34%
4) Anti-microbial
5) Wet Film Thickness: Minimum 4.0 to 5.3 Mils
c. Block Filler Throughout.
1) **BASIS OF DESIGN**: Sherwin Williams: PrepRite Latex Block Filler: www.sherwin-williams.com.
d. Block Filler in Showers.
1) **BASIS OF DESIGN**: Sherwin Williams: Kem Cati-Coat HS Epoxy Filler/Sealer: www.sherwin-williams.com.

B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
1. Medium duty applications include doors and door frames.
2. Two top coats and one coat primer.
3. High Performance Architectural Interior.
a. Products:

1) **BASIS OF DESIGN:** Sherwin Williams: Pro Industrial Pre-Catalyzed Waterbased Epoxy K46-150 Series Semi-Gloss: www.sherwin-williams.com.

b. Product Type: Acrylic
c. Volume Solids: Minimum 37%
d. Wet Film Thickness: Minimum 4.0 to 8.0 Mils

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. **BASIS OF DESIGN:** Sherwin Williams: Gypsum Board and Plaster Primer: B28W2600 ProMar 200 Zero VOC Interior Latex Primer
2. **BASIS OF DESIGN:** Sherwin Williams: Interior Metal Primer: B66W1310 Pro Industrial Pro-Cryl Universal Primer
3. **BASIS OF DESIGN:** Sherwin Williams: CMU Primer: B42W150 Pro Industrial Heavy Duty Block Filler
4. **BASIS OF DESIGN:** Sherwin Williams: B51W01150 Extreme Bond - Interior/Exterior Bonding Primer: www.sherwin-williams.com.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 INSTALLERS

A. Engage an experienced Contractor who has completed paint or coating applications similar in material, design, and extent to that indicated for the Project that have resulted in construction with a record of successful in-service performance. Experienced craftsmen shall apply all paints and coatings.

3.02 HEALTH AND SAFETY

A. Physical Barrier: A continuous physical barrier shall be maintained between work areas and occupied/populated areas, especially indoors.

B. Fresh Air: Fresh air shall be provided in appropriate quantities and temperatures while painting within University buildings.

C. Protect From Fumes: Appropriate steps shall be taken to protect all personnel, especially building occupants and/or pedestrians, from dust and/or fumes that are potentially harmful.

3.03 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. **Report any condition that may potentially effect proper application.**

D. Test shop-applied primer for compatibility with subsequent cover materials.

3.04 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application. Remove all paste from the entire wall surface by washing prior to painting.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. All paint and coatings shall be applied in a workmanlike manner so as to produce an even film of specified uniform thickness. Edges, corners, crevices, and joints shall receive special attention to ensure that they have been thoroughly cleaned and that they receive an adequate thickness of paint. The finished surface shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be so complete that the addition of another coat of paint would not increase the hiding. All coats shall be applied so as to product a film of uniform thickness. Special attention shall be given to ensure that edges, corners, crevices, welds, and similar areas receive a film thickness equivalent to adjacent areas, and installations shall be protected by the use of drop cloths or other approved precautionary measures.

H. Previously Coated Surfaces: Maintenance painting will frequently not permit or require complete removal of all old coatings prior to repainting. However, all surface contamination such as oil, grease, loose paint, mill scale dirt, foreign matter, rust, mold, mildew, mortar, effloresce, and sealers must be removed to assure sound bonding to the tightly adhering old paint. Glossy surfaces of old paint films must be clean and dull by sanding. Spot prime any bare areas with an appropriate primer. Recognize that any surface preparation short of total removal of the old coating may compromise the service length of the system. Check for compatibility by applying a test patch of the recommended coating system, covering at least 2 to 3 square feet. Allow to dry one week before testing adhesion per ASTM D3359. If the coating system is incompatible, complete removal is required per ASTM D4259.

I. Beginning the Work of this Section without reporting unsuitable conditions to the Owner constitutes acceptance of conditions by the Contractor. Any required removal, repair, or replacement of the Work caused by unsuitable conditions shall be done at no additional cost to the Owner.

J. All marred or abraded spots on shop-primed and factory-finished surfaces shall receive touch-up restoration prior to any other coating application.

K. Remove or repair existing paints or finishes that exhibit surface defects.

L. Surfaces shall be free of drips, runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. **Sand substrate to remove imperfections prior to applying primer coat.**

M. Protect all adjacent interior surfaces and areas, including rating and instruction labels on doors, frames, equipment, piping, etc., from painting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make god any damage caused by failure to provide such protection.

N. Masonry - CMU & Brick:
   1. Prepare surface as recommended by top coat manufacturer.
   2. Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement and hardeners.

O. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

P. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

Q. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.05 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions.

C. All hollow metal doors and frames shall be painted by a sprayer - free of brush strokes.

D. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

F. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

G. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

H. Sand metal surfaces lightly between coats to achieve required finish.

I. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

J. New Drywall:
   1. Drywall Tape: Drywall tape shall be applied to ALL corner beads to prevent cracking.
   2. (3) Coats Drywall Compound: Three full coats of drywall compound shall be applied to each tape joint - (1) all purpose coat and (2) top coats. (3) coats of compound shall be applied to each screw head.
   3. Sand Compound: Compound shall be sanded after each application. All dust generated by sanding shall be captured by HEPA vacuum equipment in areas where occupants, computers or other sensitive equipment could be exposed.
   4. Sealer & Finish: All drywall shall receive (1) coat of latex primer-sealer and (2) full coats of appropriate finish paint.

K. Equipment, Piping and Supports:
   1. Prime and Paint: All unfinished equipment, piping, and supports shall receive one coat of solvent-based rust-check oil primer followed by a finish coat of Owner approved paint.
   2. Labels: All piping shall be color coded and/or labeled as specified.

L. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.06 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.07 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.08 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 10 2600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Crash rails.

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Shop Drawings: Include plans, elevation, sections, and attachment details.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Stock Materials: One minimum 96 inches long unit of metal crash rails.

F. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Protect work from UV light damage.

D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide manufacturer's standard limited lifetime warranty against material and manufacturing defects.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Crash Rails:
   1. Construction Specialties, Inc; ECR-32A Heavy Duty Metal Crash Rail: www.c-sgroup.com/#sle.
   2. Inpro; 50AA Aluminum Wall Guard: www.inprocorp.com/#sle.
   3. Nystrom, Inc; CRAE4 Aluminum Crash Rail: www.nystrom.com/#sle.

2.02 PRODUCT TYPES

A. Metal Crash Rails: Factory- or shop-fabricated, with preformed end wall returns, and internal and external corners:
   1. Material: Metal; 6063-T5 Aluminum, clear anodized finish.
   2. Mounting: Surface.

3. Bracket Type: "I" Beam, manufacturer's standard configuration, with eased edges at possible hand contact surfaces.
    a. Bracket Spacing: 48 inches on center, maximum. Project -specific spacing to be determined based on field measurements.
    b. Projection From Wall to Inside of Rail: 3 inches.
    c. Bracket-to-Wall Attachment: Fasteners/anchors recommended by rail manufacturer for wall construction conditions encountered.
4. Rail Type: Continuous metal bar.
    a. Rail Profile: Rectangular, 1/4 inch by 4 inches, with round top and bottom (elongated oval cross-section).
    b. Rail Configuration: Continuous line, with terminations only installed at doors, electrical panels, and fire-extinguisher cabinets, including items prohibited from being blocked by authorities having jurisdiction. Maintain rail continuity around all other wall configurations, protrusions, piers, abutments, and similar items. Rail and bracket layout to maintain typical projection dimension from wall to inside of rail, unless otherwise indicated.
    c. Terminal ends, inside, and outside corners fabricated as an integral part of the rail.
    d. Rail-to-Bracket Attachment: Stainless steel flat-head, countersunk, machine screw with locking, nylon-insert ESNA nut.
    e. Return rail to be 1/2 inch clear of wall.
5. Finishes.
    a. Clear anodized.

B. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.

2.03 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

2.04 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that field measurements are as indicated on drawings.

C. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Terminate rails 1 inch short of door openings and intersecting walls.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.04 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 10 2800

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Under-lavatory pipe supply covers.

C. Utility room accessories.

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a (Reapproved 2019).

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017.

F. ASTM C1036 - Standard Specification for Flat Glass; 2021.

G. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.

1.03 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, and Samples for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. American Specialties, Inc: www.americanspecialties.com/#sle.
   2. Bobrick Washroom Equipment, Inc.: www.bobrick.com.
   3. Bradley Corporation: www.bradleycorp.com/#sle.
   4. Substitutions: Section 01 6000 - Product Requirements.

2.02 MATERIALS

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: Provide two keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

F. Adhesive: Contact type, waterproof.

G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

D. Powder-Coated Steel: Clean, degrease, and neutralize. Follow immediately with a phosphatizing treatment, prime coat, and two finish coats of powder coat enamel.

E. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.

F. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

G. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Multiple roll, surface-mounted, stainless steel unit, lockable.
   1. Dispenser frame shall be constructed of 18 gauge - 304 gauge stainless steel with no moving parts.
   2. Roll holder rod shall be constructed of 1-1/8 inch diameter 20 gauge - 304 stainless steel tubing.
   3. Optional master locks are keyed the same.
   4. Anti-theft design with a 10 year guarantee against breakage.
   5. Provide 2-roll dispenser at single-user restrooms.
      a. Size: 10-1/4 inch long by 4 inch deep by 5 inch high.
      b. Roll tube length: 11-1/2 inch.

B. Paper Towel Dispenser Roll
   1. Tork; Tork Matic Hand Towel Dispenser with Sensor, Stainless, Article 461002: www.torkusa.com.

C. Soap Dispenser:
   1. GOJO, ADX-12, Chrome, Push-Style Dispenser for GOJO® Foam Soap, Stores.

D. Hand Sanitizer Dispenser:
   1. Purell, LTX-12, Chrome, Touch-free Dispenser for Purell Hand Sanitizer.

E. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
   1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
   2. Size: 36 inches tall x 24 inches wide at lavatory locations.
   3. Frame: 0.05 inchchannel shapes, with mitered and welded and ground corners; bright annealed finish.
   4. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.

F. Grab Bars: Stainless steel, smooth surface.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force, minimum.
      b. Dimensions: 1-1/2 inch outside diameter, minimum 0.05 inch wall thickness, concealed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
      c. Finish: Satin.
      d. Length and Configuration: As indicated on drawings.

2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:

1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.

2.06 UTILITY 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. Hooks: Three, 0.06 inch stainless steel rag hooks at shelf front.
2. Mop/broom holders: Four spring-loaded rubber cam holders at shelf front.
3. Length: Manufacturer's standard length for number of holders/hooks.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

D. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
1. Grab Bars: As indicated on drawings.
2. Mirrors: 40 inch, measured from floor to bottom of mirrored surface.
3. Other Accessories: As indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 4300
EMERGENCY AID SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Automated external defibrillators (AEDs).

B. Accessories.

1.02 DEFINITIONS

A. Automated External Defibrillator (AED): A Food and Drug Administration (FDA)-approved portable device, which automatically analyzes the heart rhythm and recognizes the presence of ventricular fibrillation and/or tachycardia. If defibrillation is warranted, the AED automatically charges and prompts (visual and/or audio) the operator to deliver an electrical shock.

1.03 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide AED operational features, color and finish, anchorage details, and installation instructions.

C. Maintenance Data: Include test schedules and recertification requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Automated External Defibrillators (AEDs):
   1. Philips Medical Systems: www.usa.philips.com/#sle.
   2. Stryker Corporation; LIFEPAK CR2 Defibrillator - LP-CR2: www.stryker.com/#sle.

B. Emergency Aid Cabinets and Accessories:
   1. Activar Construction Products Group, Inc. - JL Industries; LifeStart 1400 Series AED Cabinet: www.activarcpg.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 AUTOMATED EXTERNAL DEFIBRILLATORS (AEDS)

A. Automated External Defibrillators (AEDs) - General: FDA approval required.

2.03 EMERGENCY AID CABINETS

A. Type: Automated external defibrillator (AED).

B. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

C. Cabinet Construction: Non-fire-rated.
   1. Formed primed steel sheet; 0.036 inch thick base metal.

D. Fire-Rated Cabinet Construction: Match rating of wall.
   1. Steel; double wall or outer and inner boxes with 5/8 inch thick fire barrier material.

E. Cabinet Configuration: Semi-recessed type.
   1. Size to accommodate AED.
   2. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim.

F. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with wire pull handle and nylon catch. Hinge door for 180 degree opening with continuous piano hinge.

G. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

H. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.

I. Fabrication: Weld, fill, and grind components smooth.

J. Finish of Cabinet Exterior Trim and Door: Powder coat, white color.

K. Finish of Cabinet Interior: White powder coat.

2.04 ACCESSORIES

A. Theft Alarm: Battery operated audible and strobe light alarm, 10 second delay for disarming, activated by opening cabinet door. Alarm deactivated when door is closed.

B. Alarm Contacts: Contact devices.

C. Cabinet Door Signage: "AED" decal, or vinyl self-adhering, prespaced red lettering and identifying graphic in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, ____ inches from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place AEDs in cabinets.

E. Cabinet Lettering:
   1. Location: Face of door framing.

3.03 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust cabinet doors to operate smoothly without binding. Verify that alarms and integral locking devices operate properly.

C. On completion of cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes. Replace cabinets that cannot be restored to factory-finished appearance. Use materials and procedures recommended by cabinet manufacturer.

3.04 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals for closeout submittals.

B. See Section 01 7900 - Demonstration and Training for additional requirements.

C. Demonstrate proper operation of AED to Owner's designated representative.

END OF SECTION

SECTION 10 4400

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

1.02 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

B. FM (AG) - FM Approval Guide; current edition.

C. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

D. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, and Samples, for submittal procedures.

B. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, and color and finish.

C. For fire extinguisher cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.04 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Ansul, a Tyco Business: www.ansul.com/#sle.
   2. Amerex Corporation: www.amerex-fire.com
   3. Buckeye Fire Equipment: www.buckeyefire.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Activar Construction Products Group - JL Industries: www.activarcpg.com/#sle.
   2. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C type.
   2. Size: 5 pound.
   3. Finish: Baked polyester powder coat, red color.

4. Temperature range: Minus 40 degrees F to 120 degrees F.
5. Products:
    a. Amerex Model B500/B500T.
    b. Ansul Sentry Model A05.
    c. Buckeye Model 5ABC.

2.03 FIRE EXTINGUISHER CABINETS

A. Cabinet Construction: Non-fire rated. Manufacturer's standard enameled steel box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

B. Cabinet Configuration: Semi-recessed type.
    1. Exposed Trim: One piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
        a. Rolled edge trim with 2-1/2 inch backbend depth.

C. Door Style: Manufacturer's standard design, solid panel. Full flush opaque panel of material indicated.

D. Door Hardware:
    1. Provide manufacturer's standard door operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide concealed or continuous type hinge permitting door to open 180 degrees.
    2. Special requirement: Provide recessed concealed handle with cam action latch.

E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

F. Fabrication: Weld, fill, and grind components smooth.

G. Finish of Cabinet Exterior Trim and Door: Baked enamel, white color.

H. Finish of Cabinet Interior: White colored enamel.

I. Graphic Identification: Identify fire extinguisher in cabinet with "FIRE EXTINGUISHER" lettering applied to door vertically, red color. Provide lettering to comply with authorities having jurisdiction for letter style, size, spacing, and location.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in locations and at mounting heights indicated or, at heights to comply with applicable regulations of governing authorities. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

C. Install cabinets plumb and level in wall openings. Fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb.

D. Secure rigidly in place.

E. Place extinguishers in cabinets.

END OF SECTION

SECTION 10 7313
AWNINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal awnings.

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Metal Product Data: Product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.

C. Shop Drawings: Indicate awning profiles, sizes, connection attachments, anchorage, size and type of fasteners, accessories and locations.

D. Selection Samples: Manufacturer's color charts for metal framing and awning panel colors and finishes.

E. Designer's qualification statement.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Executed warranty.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Awnings:
   1. AVAdek Walkway Covers & Canopies: www.avadek.com/#sle.
   2. Construction Specialties, Inc: www.c-sgroup.com/#sle.
   3. Rusco Custom Canopies: www.superdeckaluminumcanopies.com/#sle.
   4. Mapes Canopies; Super Lumideck: www.mapes.com.

2.02 AWNINGS - GENERAL

A. Design Criteria: Design and fabricate to resist the following loads without failure, damage, or permanent deflection:
   1. See Structural drawings for wind, snow, and live loads.
   2. Thermal Movement: Plus/minus 1/8 inch, maximum.

B. Configuration: As indicated on drawings.

C. Provide a complete system ready for erection at project site.

D. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.

2.03 METAL AWNINGS

A. Description: Flat, sloped, or gabled metal framework with metal covering attached to building exterior over a door or window to protect from sun or rain. Water shall drain from covered surfaces into concealed integral fascia gutter and directed to the rear for ground level discharge via downspout.

B. Type: Cantilevered mount.

C. Size: As indicated on drawings.

D. Framework: Aluminum.

E. Covering Materials:
   1. Interlocking extruded aluminum decking modules.

2.04 COMPONENTS

A. Aluminum Framing System:
   1. Aluminum Outriggers, Front Bars, Diagonal Supports, Hinged Arms, Mounting Brackets, Shapes, and Plates: ASTM B211/B211M, 6063 alloy, T6 temper.
   2. Fittings: Elbows, T-shapes, wall brackets; cast aluminum.
   3. Mounting: Brackets and flanges, with aluminum inserts for embedding into masonry.
   4. Splice Connectors: Concealed spigot; cast aluminum.
   5. Exposed Fasteners: Flush countersunk stainless steel screws or bolts; consistent with design of system.
   6. Exposed Aluminum Finish: Superior performing organic coatings.

2.05 FABRICATION - FRAMING

A. Fit and shop assemble components in largest practical sizes, for delivery to site.

B. Fabricate components with joints tightly fitted and secured.

C. Exposed Fastenings: Unobtrusively located; consistent with design of component, except where specifically noted otherwise.

D. Supply components required for anchorage of framing. Fabricate anchors and related components of same material and finish as framing, except where specifically noted otherwise.

E. Continuously seal joined pieces by intermittent welds and plastic filler.

F. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

G. Accurately form components to suit each other and to building structure.

2.06 FINISHES

A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.

B. Finish Color: As selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall substrate anchors are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be embedded in masonry with setting templates, to appropriate Sections.

3.03 INSTALLATION - FRAMING

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects.

C. Provide anchors required for connecting framing to structure. Anchor framing to structure.

D. Field weld anchors as indicated on shop drawings. Grind welds smooth. Touch-up welds with primer.

E. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 INSTALLATION - METAL COVERING

A. Install in accordance with manufacturer's instructions.

B. Fasten metal covering panels to metal support members, aligned level and plumb.

C. Install fascia panels, trim, and flashing. Install flashing between adjacent structures and the canopy in a manner to prevent any runoff between the two. Ends of decking, beams, and joints shall be capped and sealed to control drainage.

D. Separate dissimilar metals using concealed bituminous paint.

E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.05 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Misalignment From True Position: 1/4 inch.

END OF SECTION

SECTION 11 1900

DETENTION EQUIPMENT CONTRACTOR

PART 1 - GENERAL

1.01 SUMMARY

A. A single pre-qualified Detention Equipment Contractor (DEC) shall provide the entire scope of work specified below. None of the materials, equipment, systems or labor specified or required for the complete installation of the scope of work below shall be provided or bid as separate packages outside of the Detention Equipment Contractor's subcontract.

B. DEC shall furnish all labor, equipment, appliances, services and materials, perform work, and otherwise assume all responsibility related to procurement and installation of equipment, products and materials as indicated in the scope of work below. DEC shall self-perform installation of materials required in this scope of work. Installation subcontractors will not be allowed.

C. DEC shall coordinate and interface with Security Electronics Contractor (SEC) as required for a complete, operational system.

D. DEC must base its bid on the products by the manufacturers that are specified in this scope of work.

E. Any bid from a General Contractor that does not include the name of a pre-qualified DEC in the appropriate space provided on the bid form will be automatically rejected. Only one (1) name will be allowed.

1.02 SECTION INCLUDES

A. The scope of work for the DEC includes the following specification sections:

1. Section 08 3453 – Detention Doors and Frames
2. Section 08 5663 – Detention Windows
3. Section 08 7153 – Detention Door Hardware
4. Section 08 8853 – Security Glass and Glazing
5. Section 11 1970 – Security Woven Rod, Mesh and Screens
6. Section 12 5500 – Detention Furniture
7. DIV 28 00 00 – Security Electronics

B. Products furnished, but not installed under this scope of work:

1. Security hollow metal door frames, sidelights, borrowed lights, windows and control room frames.
2. Steel embeds required to anchor detention equipment furnished under this scope of work to concrete or masonry.

C. Related work to be performed by others:

1. Installation of embeds.
2. Installation of security hollow metal doorframes, sidelights, borrowed lights, windows and control room frames.
3. Grouting of security hollow metal frames.
4. Caulking and sealants, including detention caulking and sealants.
5. Casework and millwork.

6. Final cleaning.
7. Finish painting.

1.03 SYSTEM DESCRIPTION

A. Design requirements:

Detention equipment shall be designed specifically for detention use, simple in construction and operation, and free from parts susceptible to unusual wear or maintenance requirements.

B. Performance requirements:

Detention equipment shall be use-proven through satisfactory performance under actual jail or prison conditions.

1.04 DEFINITIONS

A. DEC: Detention Equipment Contractor

B. GC:General Contractor

1.05 SUBMITTALS

A. Shop drawings of all materials and equipment provided in this scope of work shall be submitted for approval. They shall indicate item location, size, type of materials, construction, finishes, spacing of anchors and joinery details with adjacent work. The DEC shall extensively check each of the submittals under its scope of work, ensuring their correctness and compatibility not only with each other, but also with the contract documents. It shall be the General Contractor's responsibility to coordinate the DEC's work with other trades.

B. The hollow metal manufacturer shall indicate any specified fire rated openings that cannot be fire labeled and reasons why they cannot. If the designer furnishes the name of an approved manufacturer who can supply the fire labeled openings in question, the manufacturer shall be required to furnish the openings with fire labels at no additional cost. However, if label openings are not available as designed, the designer shall either authorize the necessary changes in opening design, hardware, glass and/or other features, which will bring the openings into compliance or drop the fire-labeling requirement on openings in question. Manufacturing the openings "Label Construction" without factory applied fire labels shall be unacceptable.

C. Upon receipt of the approved security hardware schedule, the DEC shall promptly provide the hardware manufacturer's templates to all manufacturers requiring the information prior to commencement of fabrication.

D. Quality control submittals (for information only):

1. Certification that fire rated door assemblies bear UL or Warnock Hersey Label for scheduled fire rating.
2. Certified test reports from an independent testing laboratory verifying that security hollow metal doors meet or exceed specified design criteria and that security glazing meets specification requirements.
3. Label Construction Certification: Manufacturer’s certification for oversize doors or doors not otherwise suitable for fire rating. Certify that door and frame assembly has been constructed with materials and methods equivalent to requirements for labeled openings per ASTM E152.
4. Manufacturer’s installation instructions.

E. Contract closeout submittals:

1. Operating/Maintenance manuals:
   a. Include the following, as applicable, for each type of detention door hardware and operating and locking device provided under this scope of work:
      1) Operating instructions.
      2) Wiring diagrams for locking device wiring.
      3) Lubrication and maintenance requirements.
      4) Spare parts list.
2. Owner instruction reports.
3. Warranty.

F. Substitutions: No substitutions of materials or equipment will be permitted where specific trade names or manufacturers are listed, unless the Architect adds the proposed substitution by addendum.

1. Materials and products specified by name of manufacturer or brand trade name shall be the basis of the bids received, unless changed by addendum prior to the bid dates.
2. In the event a contractor wishes to use any materials or products other than those specified, a written request shall be made to the Architect within the required time frame identifying the proposed substitution and providing sufficient data for the Architect to make a determination.
3. All additional costs resulting from the use of an approved substitution by the DEC shall be borne by the DEC without additional expense to the Owner. Such additional costs shall include necessary modifications and alterations to structures, equipment, raceways and furnishing of all additional materials required to affect the substitution.

1.06 QUALITY ASSURANCE

A. In order to establish and maintain the standard of quality required for this project, only the pre-qualified DEC's listed below, or DEC's subsequently pre-qualified by addendum will be allowed to perform the work under this section of the specifications.

B. The following DEC's are pre-qualified to perform the work of this section:

1. Pauly Jail Building Company, Inc
2. CML Security
3. Southern Folger Detention

C. Any DEC not listed above that intends to submit a bid to perform the work under this section of the specifications must submit the following pre-qualification data to the Architect in writing no later than twenty-one (21) days prior to bid date. If approved, acknowledgement shall be by addendum prior to bid date. Verbal approval will not satisfy this requirement. All DEC's except those listed above shall submit all information exactly as indicated below, or they will not be pre-qualified to perform this portion of the Work. Grounds for disqualification shall exist if any of the information submitted is inaccurate, or if in the opinion of the Architect, does not satisfy the pre-qualification requirements.

1. Evidence that the DEC has a minimum of ten (10) years experience in successfully completing projects of equal scope and magnitude with products as herein specified. This evidence shall consist of a list of ten (10) projects that have been complete and operational for a minimum of five (5) years. Provide the following information for each facility:
   a. Name and location of the facility.
   b. Value of the contract and scope of work performed.
   c. Date of occupancy by the Owner.

d. Names and phone numbers of the representatives to contact for the Owner, the Construction Manager or General Contractor and the Architect.

2. Notarized statement indicating that employees of the firm seeking pre-qualification will install all equipment provided under this scope of work in lieu of DEC utilizing an installation subcontractor.
3. Sample CPM schedules for each of at least two (2) previously completed projects commensurate in size and scope to this project, graphically indicating both initially projected and actual durations required for all major activities in the respective scopes of work.
4. Independently audited financial statements for the previous three (3) years.
5. Notarized statement indicating that firm seeking pre-qualification has not filed for bankruptcy protection within the past ten (10) years.
6. Current letter from a surety company that has an AM Best “A15” rating stating that a 100% payment and performance bond can be supplied if firm seeking pre-qualification is the successful Detention Equipment Contractor (DEC) on this project. Letters from bonding agents will not be acceptable.
7. Current letter from the security lock manufacturer to be utilized on this project stating that DEC seeking pre-qualification is a factory trained, fully authorized installer of the manufacturer’s complete line of products.
8. Complete list of key employees (both office and field personnel) indicating areas of responsibility and years of experience.
9. Failure to provide any of above information or to comply with any of above requirements will result in disqualification of firm seeking pre-qualification.
10. Pre-qualification of a DEC does not relieve that DEC from the requirement to furnish all materials from the manufacturers specified herein.

D. The Architect will promptly review pre-qualification requests to determine the acceptability of each prospective DEC. Those found acceptable will be named subsequently by addendum as pre-qualified to bid and perform the scope of work under this section. Verbal approval will not satisfy this requirement.

E. Owner and Architect reserve the right to disqualify manufacturers, equipment suppliers and contractors who do not strictly comply with requirements of this section or product substitution procedures called for in this section and Division 1. Grounds for disqualification shall exist if it is determined that the information submitted is inaccurate, or in the opinion of the Architect, does not satisfy the pre-qualification requirements.

F. Any bid from a General Contractor that does not include the name of a pre-qualified DEC in the appropriate space provided on the bid form will be automatically rejected. Only one (1) name will be allowed.

1.07 DELIVERY, STORAGE AND HANDLING

A. The General Contractor (GC) shall be responsible for the following:

1. Receive from carrier, unload and store all products and materials that are furnished-only by the DEC for installation by others.
2. Provide temporary access openings required through walls to permit the placing of the detention equipment in the areas of the building where it is to be installed and provide use of hoist, cranes, elevators and lifts and/or cranes on regular time with qualified operators.
3. Protect all materials during storage on the job and after installation. All protection required while working and/or cleaning adjacent materials should be the responsibility of the General Contractor.
4. Provide an adequate, secure, dry, lockable storage area or room in each building and floor (if high rise) for all materials specified in this section.
5. Ensure that all embedded items are installed plumb and true.

B. The DEC shall be responsible for receiving, unloading and distribution of all products furnished and installed under this scope of work.

1.08 REGULATORY REQUIREMENTS

A. All work is to be performed in compliance with latest editions of:

1. Federal, state, and local codes and ordinances, or agencies having jurisdiction.
2. National Electric Code, NFPA 70.
3. Standard for Fire Doors and Windows, NFPA 80.
4. Life Safety Code, NFPA 101.

B. In cases where Specifications call for materials or construction of better quality or larger size than codes require, Specifications shall take preference. Codes shall govern in cases of direct conflict with Specifications or Contract Drawings.

1.09 WARRANTY

A. Provide Owner with written warranty covering products provided under this section for period of one (1) year from date of Owner acceptance. During this period, make necessary repairs and corrections to defects in the Work and replace defective parts at no cost to Owner.

B. Warranty does not cover consequential or incidental damages. Work made necessary by abuse, misuse, accidents, or negligence of using personnel is excluded from this agreement.

C. Provide emergency service during warranty period, including maximum twenty-four (24) hour response time for emergency calls requiring visits to facility.

1.10 MAINTENANCE MANUALS/SPARE PARTS

A. Provide Owner with three (3) copies of operating and maintenance manuals for products furnished and installed under this scope of work. Clearly identify all parts and include manufacturer's standard part number for each component of various mechanisms.

B. Provide spare parts per requirements of individual specification sections.

1.11 KEYS FOR LOCKS

A. Provide safekeeping of keys for locks provided under this section. Ensure that building security is not breached through job site loss or theft of keys being used for hardware installation or "fit-up" purposes.

B. Die-stamp each key with identification code designated on approved keying schedule.

PART 2 - PRODUCTS

2.01 The DEC shall utilize only listed approved manufacturers, component fabricators and suppliers. Any other manufacturers, component fabricators or suppliers must be approved by addendum no later than fourteen (14) days prior to bid date.

2.02 The DEC shall be responsible for the integration, interfacing and coordination of all products and systems with other related parties as hereinafter defined and specified.

PART 3 - EXECUTION

3.01 PREPARATION

A. DEC responsibilities:

1. Examine the areas and conditions under which installation is to occur and document conditions detrimental to the proper and timely completion of the work. Report unsatisfactory conditions to Architect in writing. Do not proceed with installation until unsatisfactory conditions have been corrected.
2. Prior to installation, meet at project site for purpose of reviewing products and installation methods selected, procedures to be followed in performing the work and coordination with other trades.
3. Protect adjacent surfaces from damage and stains during installation of materials provided in this scope of work.
4. Ascertain location and arrangement of anchorage required for equipment supplied under this scope of work; coordinate with other trades where necessary to make provisions for installation.
5. Furnish setting drawings, diagrams, templates, instructions and directions for installation of all products. Coordinate delivery of such products to project site.
6. Distribute all items to installation locations immediately prior to installation, complying with all applicable product handling requirements. Coordinate timing of distribution.
7. Coordinate with other trades for proper location of rough-in services and service connections specified elsewhere.

B. GC responsibilities:

1. Provide openings through exterior and interior building walls to accommodate ingress of detention equipment. Coordinate sizes and locations of openings with DEC.
2. Ensure accuracy of building construction, including sizes and locations of beams and columns, concrete and masonry walls, evenness of concrete and dimensional consistency.
   a. Concrete floors and ceilings should be level and true.
   b. At locations where concrete is uneven, chip or grout as required for proper fit between detention equipment and concrete.
3. Broom clean, properly light and heat areas of building where detention equipment is to be installed.
4. Prior to installation of electrical and mechanical hardware or locking and operating devices, exterior-closing walls should be in place, exterior windows glazed and roof completely installed to prevent weather damage to components. Provide DEC with written notification to proceed with installation once these conditions have been met. Installation will not commence until DEC receives written notification.
5. Provide 220 volt AC, 60-cycle, 3 phase power and/or 120 VAC, 60-cycle single phase power for use by DEC in connection with installation of detention equipment.
   a. If permanent power service is not available within reasonable access to detention areas when installation of detention equipment begins, provide temporary power (50 amps per welding machine) and bear expense.
   b. If sufficient temporary power is not available, reimburse DEC for extra labor and fuel required for use of gasoline welding machines.

3.02 INSTALLATION

A. General:

1. Install fixtures, materials, assemblies and equipment in strict compliance with Specifications, Contract Drawings and manufacturers' recommendations and instructions.
2. Provide necessary drawings, setting diagrams or other information required to contractor responsible for installation of DEC-furnished items to be installed by others.

B. Attachment of detention equipment:

1. Secure detention equipment permanently in place with minimum of exposed fasteners and free from warp, twists, bends, rough edges, cracks, or open joints. Exposed fasteners shall be uniform in size, spacing, and appearance and shall be tamper-resistant.
2. Punch boltholes not more than l/l6 inch larger in diameter than bolts to be used. Accurately space and align holes to permit insertion of bolts. When bolts are used, nuts shall be tightly drawn and bolt threads battered to prevent removal.
3. Remove loose scale, rust, oil, or other foreign matter from surfaces to be welded. Welds shall show uniform cross-sections, good penetration of base metals and smoothness of weld metal with a minimum of craters, porosity and clinkers.
4. Thoroughly clean burns, welds, and welding spatter on detention equipment resulting from fabrication and installation.
5. Welds that are neat in appearance and evenly spaced shall not require grinding.

C. Supervision:

1. Work shall be performed under direct supervision of a competent, experienced, factory-trained project superintendent who shall be a full-time employee of the DEC.
2. DEC's superintendent shall be present at job site during all phases of installation of the equipment furnished and installed under this section.
3. DEC shall be responsible for conduct and performance of job site personnel and shall ensure that this scope of work progresses without serious conflict with related work being performed simultaneously by other trades.

3.03 PROTECTION AND CLEANING

A. During installation, protect adjacent surfaces and detention equipment from damage. Work shall be free from scratches, dents, permanent discolorations and other defects.

B. During installation, keep storage and work areas neat, orderly and in a broom clean condition.

C. Whenever hardware is located in areas where it may be subject to damage during construction by other trades, GC shall ensure that hardware is adequately protected or schedule the installation to occur after the hazardous condition is eliminated.

D. Hardware shall be cleaned as necessary to restore correct operation, function and finish.

E. All final cleaning shall be the responsibility of the General Contractor.

3.04 ADJUSTMENTS

A. Prior to final inspection, test all electric locks, sliding door locking devices and door position sensors and adjust as required to provide proper functions.

B. Check all mechanical hardware items to ensure correct operation and function. Adjust and lubricate moving parts as required to operate smoothly and quietly without binding. Replace any items that cannot be adjusted to operate as intended for its application.

3.05 DEMONSTRATION, OPERATING INSTRUCTIONS AND TRAINING

A. The object of the operating/maintenance manuals, training materials and instruction period shall be to communicate a total understanding of operations and maintenance of all detention equipment included in this scope of work. Submit proposed operating/maintenance materials and training materials for review, comment and approval by the Architect and Owner. Coordinate with

Owner to review materials and instruction periods to assure Owner instruction and information requirements will be met. Obtain approval prior to scheduling training session.

B. Provide representative(s) with thorough knowledge of products provided under this scope of work to the Owner for an on-site instruction and training period involving Owner's designated personnel. Representative(s) must be capable of training personnel in the adjustment and operation of detention equipment, including pertinent safety requirements, as well as instructing maintenance personnel in operation, repair and upkeep. Instruction shall be given during the first week after substantial completion, unless additional adjustments or repairs are required prior to training. In such case, training sessions are not to occur until such adjustments or repairs have been satisfactorily completed. On-site instruction and training period will not one eight (8) hour day.

END OF SECTION

SECTION 11 19 70

SECURITY WOVEN ROD, MESH AND SCREENS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Security Woven Rod, Mesh and Screen mezzanine wall barriers, open window coverings and screens.

1.2 REFERENCES

A. ASTM C423.

B. ASTM E5795.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Manufacturer shall submit shop drawings, showing details of attachment to surround materials and elevations showing scope of the project.

C. Samples of materials as may be requested without cost to owner: frame sections, woven rod panel, fasteners, mullion section, corner section, etc.

1.4 QUALIFICATIONS

A. Manufacturers bidding on this project must be actively engaged in the fabrication of specified items for a minimum of Ten (10) years prior to the bid date. Manufacturers requesting approval to bid their products as equal must submit to the Architect full-size drawings, including details of construction, and a complete operating barrier sample, Fourteen (14) days prior to the bid date.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable code for combustibility requirements for materials.

1.6 NON PREQUALIFIED MANUFACTURER, SUBSTITUTIONS & EQUIVALENTS

A. Any Non-Pre-Qualified manufacturer who intends to submit a bid on this section of the Specifications shall submit the following data to the Architect in writing fourteen (14) days prior to bid date and shall be approved by addendum seven (7) days prior to bid date. Verbal approval will not satisfy this requirement. Grounds for disqualification shall exist if it is proven that the information submitted is inaccurate or, in the opinion of the Architect, does not satisfy the requirements.

1. The manufacturer of detention equipment shall have a minimum of ten (10) years successful experience in the design and manufacture of the type of detention equipment required for this project.
2. A local representative of the manufacturer specially trained in the operation and design, and with a thorough knowledge of the projects, shall be available for consultation on this project.
3. The manufacturer shall submit proof of product liability insurance.
4. Provide a narrative and historical description of the firm from inception, including history of ownership, partnership, incorporation, and/or other organizational information. Include information on the growth of the firm over time to include the number of employees, relocation(s) of the firm, major production equipment purchases and replacements.
5. List the firm's business volume (dollar amount) for the last five (5) fiscal years.
6. Provide a statement that the firm has been in business for a minimum of ten (10) continuous years, and the principals and key personnel that have been engaged in successfully providing procurement, management, installation and commissioning of security detention projects.
7. Provide a list of all employees in a super vision capacity, stating their area of responsibility and their years of experience in that capacity.
8. Submit a list of all projects completed in the last ten (10) years.
9. Submit a list of five (5) projects that this corporation, under its current name, has built in the last ten (10) years comparable in size and construction to this project and which have been in continuous operation for a minimum of five (5) years. Include in this list:
    a. Project Name, Owner, Contact Name, Address and phone number.
    b. Project Manager Name, Address and Phone Number.
    c. Using Agency Name, Address and Phone Number.
    d. Architect and Engineer of Record Name, Address and Phone Number.
    e. General Contractor and/or Construction Manager Name, Address and Telephone Number.

    For each project listed provide the following:

    a. Name and location of project.
    b. Type of project (state or federal prison, county or city jail)
    c. Project delivery method (traditional, design/bid/build, design/build, design/build/manage, general construction, construction manager, etc.)
10. Provide an audited financial statement from a recognized accounting firm for the most recent fiscal year.
11. Submit a listing of all projects in which the manufacturer is presently or has been involved in litigation and the status thereof. In addition to this statement, please respond to the following questions A through G. For any "YES" answer to the following questions, please attach a separate sheet, which provides a brief explanation of the facts, names of the parties involved, dollar amount being claimed from your firm, and the present status of the case. Attach explanations of any lawsuit alleging negligent of defective work, or breach of contract on part of the firm. Do not include lien matters, automobile accident cases, or workman's compensation cases:
    a. Has a court issued a judgment of $50,000.00 of more against the firm

or its predecessors in the past five (5) years?
_____YES _____NO

b. Has the firm or its predecessors been party to the settlement of a lawsuit with a potential value of $50,000.00 or more?
_____YES _____NO

c. Is the firm or its predecessors currently a party to a pending lawsuit with a potential value of $50,000.00 or more?
_____YES _____NO

d. In the past five (5) years has any key person, the firm or its predecessors defaulted on a loan?
_____YES _____NO

e. Has the firm of its predecessors or any person of the firm or its predecessors ever been suspended or debarred by a state, federal or municipal agency?
_____YES _____NO

f. In the past five (5) years, has the firm or its predecessors been terminated on or failed to complete any contract?
_____YES _____NO

12. Submit a statement that you will conform with the project coordination, procurement, schedules, and delivery of materials necessary to complete your scope of work.

13. A list of all current work including tentative delivery dates.

a. A statement from the president of the company as to the company's production capacity and ability to meet the schedule.

B. Any product as a substitution or equivalent shall fulfill the requirements of the specifications and have passed the same testing agency (ANSI, UL, ASTM, etc.) as referenced with the product, and include with the package an itemized list showing manufacturer, model number, sizes, finishes, noting any differences from the specified products. Also include a sample with a written list showing the names, location, and Architects of a minimum of ten (10) institutions for which similar products have been installed. List shall be submitted fourteen (14) days prior to bid and be approved seven (7) days prior to bid. Verbal approval will not be given nor satisfy this requirement. It is the Architects and Owners option to accept or reject any substitution to the equipment specified. No substitution will be allowed after the bid date.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.8 SEQUENCING

A. Sequence work under the provisions of Section 01 01 00.

B. Sequence work to ensure security mesh and woven rod are not installed in interference or detriment of other trades

C. Install security units after interior wet work is dry.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Kane Manufacturing Corporation, Kane,PA. Basis of design is Kane Manufacturing. Other manufacturers must be pre-approved in writing per Section 1.6 above.

2.4 SECURITY WOVEN ROD, MESH AND SCREENS - SKYLIGHTS

A. Basis of design Kane Vantage Wall Plus Model S-W12-Z The main frame shall be built-up tubular type, measuring 1-3/4" x 2-1/2", with fixed concealment plates. The open channel frame members shall be formed of not less than 12-gauge sheet steel and shall have individual slots along the inner edges to support the woven rod panel. The corners of the main frame shall be notched for self-aligning and robotically welded. Braces, which are similar to the frame, shall be furnished when required.

B. Concealment plates of 12-gauge steel shall be riveted to the back of the main frame approximately 8” on center to complete the tubular shape.

C. Operable panels to be located in one section of each skylight screen, concealed hinge and 106bit keyed lock to be included.

D. Infill:
1. Rods- Provide types as indicated on drawings-Woven rod panels shall be fabricated from double crimped, low carbon, mild steel, 1/4” diameter rods, woven with 2” open space.

E. Rod Attachment-Woven rod panels shall be installed symmetrically into the slotted main frame. Slots shall be centered according to the rod pattern. Each rod shall penetrate into each slot where it contacts the main frame. Every other rod shall be welded into the slot at both ends where it penetrates the main frame.

F. Finish- All interior and exterior surfaces of the main frame, rods and concealment plates shall be thoroughly cleaned in a 5-step bonderizing process. The surfaces shall receive an electro statically applied thermoplastic, polyester powder coating which shall be applied and baked to a hard mar-resistant finish in one of Kane’s standard colors.

2.5 ACCESSORIES

A. Touch-up Paint: Color to match screens and framing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions.

B. Verify that openings fit allowable tolerances, are plumb, level, provide a solid anchoring surface and comply with approved shop drawings.

3.2 INSTALLATION - GENERAL

A. Install in accordance specifications and manufacturer's instructions and as supplemented in this section.

3.3 INSTALLATION – Security Mesh and Woven Rod

A. Install in accordance with approved shop drawings.

B. Plumb and align faces in a single plane and erect barriers square and true, adequately anchored.

C. After completion of installation, barriers shall be adjusted, in working order and clean.

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

SECTION 12 3600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Wall-hung counters.

C. Sinks molded into countertops.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

B. AWI (QCP) - Quality Certification Program; Current Edition.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

D. AWMAC (GIS) - Guarantee and Inspection Services Program; Current Edition.

E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

F. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

G. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

H. PS 1 - Structural Plywood; 2009.

I. SEFA 2 - Installations; 2010.

J. WI (CCP) - Certified Compliance Program (CCP); Current Edition.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Installation Instructions: Manufacturer's installation instructions and recommendations.

G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Natural Stone Institute (NSI) Accredited Natural Stone Fabricator; www.naturalstoneinstitute.org/#sle.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

C. Quality Certification:
   1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
   2. Comply with AWMAC (GIS) woodwork association quality certification service/program in accordance with requirements for work specified in this section.

3. Comply with WI (CCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.woodworkinstitute.com/#sle.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 1/2 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) **BASIS OF DESIGN:** Wilsonart: Grey Beola (9218CM)
         2) Formica Corporation: www.formica.com/#sle.
         3) LG Hausys America, Inc: www.lghausysusa.com/#sle.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
      d. Color and Pattern: As selected by Architect from manufacturer's full line.
   3. Other Components Thickness: 1/2 inch, minimum.
   4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge; use marine edge at sinks.
   5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
   6. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

2.02 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

C. Joint Sealant: Mildew-resistant silicone sealant, white.

2.03 ACCESSORIES

A. Fixed Top-Mounted Countertop Support Brackets:
   1. Material: Steel.
   2. Finish: Manufacturer's standard, factory-applied, textured powder coat.
   3. Products:
      a. **BASIS OF DESIGN:** A&M Hardware, Inc.; Concealed Brackets: www.AandMhardware.com.

2.04 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
   1. Integral sinks: Shop-mount securely to countertop with adhesives, using flush configuration, as per manufacturer's instructions, and as detailed on drawings.

D. Wall-Mounted Counters: Provide brackets and braces as indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 12 5500

DETENTION FURNITURE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

A. Contract Drawings and General Conditions, including Supplemental General Conditions, Special Conditions and Division 1 apply to the work contained within this section.

B. Reference the following technical specifications for further work relating to security furniture requirements:

1. Section 01 00 00 – Submittals

1.02 GENERAL:

A. The work within this section of the specifications consists of the installation and furnishing of detention security furniture, as indicated herein and on the contract drawings.

B. Position furniture as indicated on the drawings.

1.03 APPROVED MANUFACTURERS:

A. The following manufacturers are approved to provide security furniture for the project:

1. Modern Detention Equipment
2. Norix Group
3. Willoughby Industries
4. Derby
5. Acorn

1.04 QUALITY ASSURANCE:

A. Security furniture manufacturer shall have a minimum of five years experience in providing these products in a correctional environment.

1.05 SUBMITTALS:

A. The contractor shall submit for approval the manufacturer's technical data sheets and installation instructions for all accessories.

B. Submit shop drawings on each item listed above, where required of the contract, in a bound folder. These shall be manufacturers cut sheets and shall include all mounting

details and hardware. Submittal shall also contain drawings showing dimensions of mounting items, metal materials, thickness, finish, method of construction, and overall dimensions. When this booklet is submitted, it shall contain a title cover sheet listing project name, specification section name and number, contractors name, date, and a space for engineering approval

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Furniture, mounting hardware, and installation instructions shall be shipped together.

B. Furniture shall be protected while on the project site to ensure that there is no deterioration or damage until installed.

PART 2 – PRODUCTS

2.01 DETENTION FURNITURE

A. Detention Mirror
   1. Construction:
      a. Mirror shall be formed from 18 Ga. type 430 stainless steel polished for high reflectivity.
      b. Mirror shall be formed from one piece.
      c. Mounting holes are to be extruded to prevent distortion.
      d. Provide double mirrors at ADA locations.

B. 4-Man Pedestal Dayroom Table
   1. Construction:
      a. Table tops and seats to be smooth, true, level, and free of sharp edges.
      b. Top and seats to be 14 Ga. type 304 Stainless Steel with a #4 finish.
      c. Reinforcement plate of top shall have flanges on all four sides with radius corners to provide 100% coverage of stainless steel top. ¼" x 1 ½" bar is used to provide additional support to the table top. A sound dampening material is used between the stainless-steel top and the reinforcement plate. Table top to be supported by 4" x 4" x 3/16" steel tubing.
      d. Stainless steel seats shall be reinforced with 12 Ga. steel drawn to a depth of 1" to fit total inside contour of seat top. Reinforcement plate shall be welded to the stainless-steel seat top.
      e. Seat supports shall be 2" x 3" x 3/16" tubing supported by a gusset leading from bottom of tubing to base plate.
      f. Base plate to be 20" x 20" x ¼" plate with four (4) holes pre-drilled for mounting the unit to the floor.
      g. One-piece, welded assembly, all welds neatly finished.
      h. Provide 4 seat ADA accessible tables with ADA etching at accessible seat location
      i. Provide etched checkerboard game top for every 4-man table.

C. Single Bunk, Floor Mount
   1. Construction
      a. Bunk pan shall be constructed of not less than 12 Ga. steel. Longitudinal flanges of mattress pan to have a double hemmed edge to create greater strength and develop a minimum of 1/8" radius on upper flange and lower corners of the pan.

b. Legs will be formed from 10 Ga. Steel, tapered and formed with a ¼" mounting pad welded to bottom end of legs for floor mounting.
c. Four (4) legs to be welded at outside corners to bunk pan and end flanges.
d. One-piece, welded assembly, all welds neatly finished.
e. Finish to be polyester powder coat finish in color selected by the architect.

D. Single Bunk, Wall Mount
1. Construction
a. Bunk pan shall be constructed of not less than 12 Ga. steel. Longitudinal flanges of mattress pan to have a double hemmed edge to create greater strength and develop a minimum of 1/8" radius on upper flange and lower corners of the pan.
b. Provide sloped brackets on bottom side of bunk formed from 10 gauge steel.
c. Embeds designed for specific wall condition to be provided for each bunk.
d. Four (4) legs to be welded at outside corners to bunk pan and end flanges.
e. One-piece, welded assembly, all welds neatly finished.
f. Prime-painted for field finish by painter.

E. Desk, Wall Mount
1. Construction:
a. Desk shall be constructed of 10 Ga. stainless steel.
b. Desk shall be constructed of one piece.
c. Mounting flanges will be 1 ½" in width.
d. Desk shall display a 1 ½" flange front and back edge. Back flange shall display a ½" radius on each corner.
e. All joints shall be welded and ground smooth.
f. Unit shall be free of all sharp edges.
g. Provide embeds designed for specific wall condition.

F. Seat, Floor Mount
1. Construction:
a. Seat shall be constructed of 14 Ga. 304 stainless steel no. 4 finish.
b. Seat top shall measure 12" diameter with a ½" flange.
c. Mounting flanges will be 1 ½" in width.
d. 10ga reinforcement plate for seat top shall be constructed of mild steel to fit total inside contour of seat and be welded to seat top and vertical pipe.
e. Stool support shall consist of 2" schedule 40 pipe, securely welded to stool top reinforcement plate and base plate.
f. Base plate shall be 9" x 9" x 3/16" mild steel construction.
g. Finish to be polyester powder coat finish in color selected by the architect.

G. Clothes Hook, Wall Mount
1. Construction:
a. Formed and welded stainless steel wall mount clothes hook with ball-joint type collapsible hook.
b. Body: 14-gauge, type 304 stainless steel
c. Hooks: Machined type 304 stainless steel

H. Security Toilet Paper Holder
1. Construction:
a. One-piece drawn 16-gauge type 304 stainless steel seamless well is welded to 14-gauge stainless flange to ensure tight fit to wall surface.
b. Bead blasted satin finish.

I. Security Grab Bars
1. Construction:
a. Provide straight and corner bars in lengths shown on the drawings.

b. 3 1/8" dia. 11-gauge type 304 stainless steel flanges are heliarc welded to 11/2" O.D. 18 gauge seamless tube.
c. Suicide resistant 11-gauge closure plate is also heliarc welded to edge between tube and wall.
d. Stainless steel #4 finish.

J. Security Shower Curtains
1. Construction of Curtain:
a. Flame Resistant
b. Anti-bacterial, anti-fungal and mildew resistant to help increase the life of the fabric
c. Can easily be cut to accommodate custom lengths on site, with no threads fraying
d. Tabs sealed every 10 inches along the top of each curtain.
e. Durable vinyl coated mesh screen curtain top facilitates air flow
f. 16 oz clear vinyl base to ensure safety and security
g. Privacy curtain middle is reinforced with a polyester scrim for greater rip stop.
2. Construction of Releasable Curtain Tabs:
a. ¾" c 6" hook tabs are fastened to molded slides, which gives the curtain a smooth glide when opening.
b. The curtain tabs can be adjusted to pull away easily from molded slides for increased security.
c. Releasable tabs and molded slides are also both sold separately for replacement.
3. Construction of Shower Curtain Track:
a. Heavy duty, custom-designed anodized aluminum curtain track includes secure end stop and bit

K. 3-Compartment Pistol Locker
1. Construction:
a. Unit shall be constructed from 7 Ga. mild steel
b. Compartments shall measure approximately 13 5/8" wide x 6 ½" high x 8" deep. Doors will be connected to frame by a continuous hinge.
c. Compartments must be of sufficient size to accommodate a semi-automatic pistol with a 14-round magazine.
d. Each compartment will have an individually keyed snap lock with Master Keys.
e. Mounting plate will have six (6) ½" diameter holes for mounting unit to the wall.

L. Detention Shelf with 4 Hooks
1. Construction:
a. Formed and Welded stainless steel wall mount shelf with four ball-joint type collapsible hooks
b. Body: 14-gauge, type 304 stainless steel
c. Hooks: Machined type 304 stainless steel

M. Detention Shelves
1. Construction:
a. Formed and Welded stainless steel wall mount shelf
b. Body: 14-gauge, type 304 stainless steel

N. Cuff Rail Bench
1. Construction:
a. Formed and Welded 10-gauge stainless steel in sizes and configurations as shown on the drawings.
b. Provide cuff rings as details on drawings.

2.05 FINISHING

A. All steel detention equipment herein specified, except stainless steel, chrome plated, galvanized and aluminum items, shall be powder coated.

B. All items listed in this section shall be cleaned of all oil and mill scale by a phosphatizing bath, and then painted to a one-mil thickness with a rust inhibiting primer.

C. Contractor to submit standard color chart to architect for selection of powder coated finish.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Once installed, all items shall be level and plumb.

B. Touch up all scratched or damaged surfaces after installation.

C. All furniture shall be anchored in a secure manner using non-removable fasteners. Plastic anchors are not acceptable. All sharp edges shall be ground smooth. Mount all items in accordance with manufacturers written instructions. All fasteners shall be stainless steel torx head security screws.

D. Detention furniture specified to be field installed to embeds shall be welded in place per the manufacturers weldment details. Welds shall be cleaned and prime painted ready for field finish paint. Fillet welds shall not be ground flush, leave weld intact and only clean and prepare for finish painting.

END OF SECTION

Preliminary

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PROJECT MANUAL

CHAMPAIGN COUNTY
SATELLITE JAIL
JAIL CONSOLIDATION

ITB #2022-009 SATELITE JAIL CONSOLIDATION PROJECT

502 S. Lierman Ave.
Urbana, IL 61802

ISSUE FOR BIDS

VOLUME 2

REIFSTECK REID

DATE: SEPTEMBER 14, 2022

RRCo PROJECT #202190

PROJECT MANUAL FOR

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VOLUME 1

VOLUME 2

VOLUME 3

VOLUME 4

MEP Specifier:
GHR Engineers & Associates Inc.
1615 S. Neil Street, Champaign, IL 61820
217.356.0536

SECTION 21 0517

SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the fire protection drawings:

1) Sleeves without waterstop.
2) Sleeves with waterstop.
3) Stack-sleeve fittings.
4) Sleeve-seal systems.
5) Grout.
6) Silicone sealants.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SLEEVES WITHOUT WATERSTOP

A. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends.

B. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.

C. Steel Sheet Sleeves: ASTM A653/A653M, 0.0239-inch minimum thickness; hot-dip galvanized, round tube closed with welded longitudinal joint.

2.2 SLEEVES WITH WATERSTOP

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, LLC.
2. CALPICO, Inc.
3. GPT; an EnPro Industries company.
4. Metraflex Company (The).

B. Description: Manufactured [**steel**] [**stainless steel**] [**galvanized steel**], sleeve-type, waterstop assembly made for imbedding in concrete slab or wall.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, LLC.
2. CALPICO, Inc.
3. GPT; an EnPro Industries company.
4. Metraflex Company (The).
5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Designed to form a hydrostatic seal of 20 psig minimum.
2. Sealing Elements: [**EPDM-rubber**] [**High-temperature-silicone**] [**Nitrile (Buna N)**] interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
3. Pressure Plates: [**Carbon steel**] [**Composite plastic**] [**Stainless steel**] [**Stainless steel, Type 316**].
4. Connecting Bolts and Nuts: [**Carbon steel, with ASTM B633 coating**] [**Stainless steel**] [**Stainless steel, Type 316,**] of length required to secure pressure plates to sealing elements.

2.4 GROUT

A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000 psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. GE Construction Sealants; Momentive Performance Materials Inc.
    b. Permathane; ITW Polymer Sealants North America.
    c. Polymeric Systems, Inc.
    d. Sherwin-Williams Company (The).
    e. Sika Corporation.
    f. The Dow Chemical Company.
    g. Tremco Incorporated.

2. Standard: ASTM C920, Type S, Grade NS, Class 25, Use NT.
3. <Double click to insert sustainable design text for sealants.>
4. <Double click to insert sustainable design text for sealants.>

B. Silicone, S, P, T, NT: Single-component, [**25**] [**100/50**], pourable, [**plus 25 percent and minus 25 percent**] [**plus 100 percent and minus 50 percent**] movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Pecora Corporation.
    b. Sika Corporation.
    c. The Dow Chemical Company.
    d. Tremco Incorporated.

2. Standard: ASTM C920, Type S, Grade P, [**Class 25**] [**Class 100/50**], Uses T and NT.
3. <Double click to insert sustainable design text for sealants.>
4. <Double click to insert sustainable design text for sealants.>

C. Silicone Foam: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Smooth-On.

2. <Double click to insert sustainable design text for sealants.>
3. <Double click to insert sustainable design text for sealants.>

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES - GENERAL

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout or silicone sealant, seal space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.2 INSTALLATION OF SLEEVES WITH WATERSTOP

A. Install sleeve with waterstop as new walls and slabs are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout or silicone sealant, seal space around outside of sleeves.

3.3 INSTALLATION OF SLEEVE-SEAL SYSTEMS

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building, and passing through exterior walls.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration,

assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
2. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

B. Prepare test and inspection reports.

3.5 SLEEVE SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Concrete Slabs above Grade:

    a. Sleeves with waterstops.

2. Interior Walls and Partitions:

    a. Sleeves without waterstops.

END OF SECTION

SECTION 21 0518

ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the fire protection drawings:

1) Escutcheons.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 DEFINITIONS

A. Existing Piping to Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. BrassCraft Manufacturing Co.; a Masco company.
2. Dearborn Brass.
3. Jones Stephens Corp.
4. Keeney Manufacturing Company (The).
5. Mid-America Fittings, LLC; A Midland Industries Company.
6. ProFlo; a Ferguson Enterprises, Inc. brand.

2.2 ESCUTCHEONS

A. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
b. Chrome-Plated Piping: One-piece steel cast brass with polished, chrome-plated finish.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
d. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
e. Bare Piping in Unfinished Service Spaces: One-piece steel with polished, chrome-plated finish.
f. Bare Piping in Equipment Rooms: One-piece steel with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

3.2 FIELD QUALITY CONTROL

A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION

SECTION 21 0523

GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the fire protection drawings:

1) Two-piece ball valves with indicators.
2) Bronze butterfly valves with indicators.
3) Iron butterfly valves with indicators.
4) Check valves.
5) Bronze OS&Y gate valves.
6) Iron OS&Y gate valves.
7) NRS gate valves.
8) Trim and drain valves.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 DEFINITIONS

A. NRS: Nonrising stem.

B. OS&Y: Outside screw and yoke.

C. SBR: Styrene-butadiene rubber.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and weld ends.
3. Set valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

D. Protect flanges and specialties from moisture and dirt.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each type of valve from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. UL Listed: Valves shall be listed in UL's "Online Certifications Directory" under the headings listed below and shall bear UL mark:

1. Fire Main Equipment: HAMV - Main Level.

a. Ball Valves, System Control: HLUG - Level 3.
b. Butterfly Valves: HLXS - Level 3.
c. Check Valves: HMER - Level 3.
d. Gate Valves: HMRZ - Level 3.

2. Sprinkler System and Water Spray System Devices: VDGT - Main Level.

a. Valves, Trim and Drain: VQGU - Level 1.

B. FM Global Approved: Valves shall be listed in its "Approval Guide," under the headings listed below:

1. Automated Sprinkler Systems:

a. Indicator posts.
b. Valves.

1) Gate valves.
2) Check valves
3) Miscellaneous valves.

C. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B31.9 for building services piping valves.

D. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

E. NFPA Compliance for valves:

1. Comply with NFPA 13, NFPA 14, NFPA 20, and NFPA 24.

F. Valve Pressure Ratings: Not less than the minimum pressure rating indicated or higher, as required by system pressures.

G. Valve Sizes: Same as upstream piping unless otherwise indicated.

2.3 TWO-PIECE BALL VALVES WITH INDICATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ames Fire & Waterworks; A Watts Water Technologies Company.
2. NIBCO INC.
3. Victaulic Company.

B. Description:

1. UL 1091, except with ball instead of disc and FM Global approved for indicating valves (butterfly or ball type), Class Number 1112.
2. Minimum Pressure Rating: 175 psig.
3. Body Design: Two piece.
4. Body Material: Forged brass or bronze.
5. Port Size: Full or standard.
6. Seats: PTFE.
7. Stem: Bronze or stainless steel.
8. Ball: Chrome-plated brass.
9. Actuator: Worm gear
10. Supervisory Switch: Internal or external.
11. End Connections for Valves NPS 1 through NPS 2: Threaded ends.
12. End Connections for Valves NPS 2-1/2: Grooved ends.

2.4 BRONZE BUTTERFLY VALVES WITH INDICATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ALEUM USA.
2. Globe Fire Sprinkler Corporation.
3. Milwaukee Valve Company.

B. Description:

1. Standard: UL 1091 and FM Global standard for indicating valves, (butterfly or ball type), Class Number 1112.
2. Minimum: Pressure rating: 175 psig.
3. Body Material: Bronze.
4. Seat Material: EPDM.
5. Stem Material: Bronze or stainless steel.
6. Disc: Bronze, stainless steel.
7. Actuator: Worm gear.

8. Supervisory Switch: Internal or external.
9. Ends Connections for Valves NPS 1 through NPS 2: Threaded ends.
10. Ends Connections for Valves NPS 2-1/2: Grooved ends.

2.5 IRON BUTTERFLY VALVES WITH INDICATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ALEUM USA.
2. Anvil International/Smith-Cooper International; Tailwind Capital, LLC.
3. Globe Fire Sprinkler Corporation.
4. Kennedy Valve Company; a division of McWane, Inc.
5. NIBCO INC.
6. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
7. Victaulic Company.
8. Zurn Industries, LLC.

B. Description:

1. Standard: UL 1091 and FM Global standard for indicating valves, (butterfly or ball type), Class Number 112.
2. Minimum Pressure Rating: 175 psig.
3. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, or polyamide coating.
4. Seat Material: EPDM.
5. Stem: Stainless steel.
6. Disc: Ductile iron, nickel plated and EPDM or SBR coated.
7. Actuator: Worm gear.
8. Supervisory Switch: Internal or external.
9. Body Design: Grooved-end connections.

2.6 CHECK VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ALEUM USA.
2. Ames Fire & Waterworks; A Watts Water Technologies Company.
3. Anvil International/Smith-Cooper International; Tailwind Capital, LLC.
4. FEBCO; A WATTS Brand.
5. Fire Protection Products Inc (FPPI); a brand of Anvil International and Smith-Cooper International.
6. Globe Fire Sprinkler Corporation.
7. Matco-Norca.
8. Mueller Co. LLC; Mueller Water Products, Inc.
9. NIBCO INC.
10. Reliable Automatic Sprinkler Co., Inc. (The).
11. Shurjoint; a part of Aalberts Integrated piping Systems.
12. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
13. United Brass Works, Inc.
14. Venus Fire Protection Ltd.

15. Victaulic Company.
16. Viking Group Inc.
17. WATTS; A Watts Water Technologies Company.
18. Wilson & Cousins Inc.
19. Zurn Industries, LLC.

B. Description:

1. Standard: UL 312 and FM Global standard for swing check valves, Class Number 1210.
2. Minimum Pressure Rating: 175 psig.
3. Type: Single swing check.
4. Body Material: Cast iron, ductile iron, or bronze.
5. Clapper: Bronze, ductile iron, or stainless steel with elastomeric seal.
6. Clapper Seat: Brass, bronze, or stainless steel.
7. Hinge Shaft: Bronze or stainless steel.
8. Hinge Spring: Stainless steel.
9. End Connections: Flanged, grooved, or threaded.

2.7 BRONZE OS&Y GATE VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Milwaukee Valve Company.
2. NIBCO INC.
3. United Brass Works, Inc.
4. Zurn Industries, LLC.

B. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 175 psig.
3. Body and Bonnet Material: Bronze or brass.
4. Wedge: One-piece bronze or brass.
5. Wedge Seat: Bronze.
6. Stem: Bronze or brass.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Threaded.

2.8 IRON OS&Y GATE VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Cast Iron Pipe Company.
2. Clow Valve Company; a subsidiary of McWane, Inc.
3. Hammond Valve.
4. Mueller Co. LLC; Mueller Water Products, Inc.
5. NIBCO INC.
6. Victaulic Company.
7. WATTS; A Watts Water Technologies Company.

8. Zurn Industries, LLC.

B. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 175 psig.
3. Body and Bonnet Material: Cast or ductile iron.
4. Wedge: Cast or ductile iron, or bronze[**with elastomeric coating**].
5. Wedge Seat: Cast or ductile iron, or bronze[**with elastomeric coating**].
6. Stem: Brass or bronze.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.

2.9 NRS GATE VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Cast Iron Pipe Company.
2. Clow Valve Company; a subsidiary of McWane, Inc.
3. Mueller Co. LLC; Mueller Water Products, Inc.
4. NIBCO INC.
5. Victaulic Company.
6. Zurn Industries, LLC.

B. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 175 psig.
3. Body and Bonnet Material: Cast or ductile iron.
4. Wedge: Cast or ductile iron[**with elastomeric coating**].
5. Wedge Seat: Cast or ductile iron, or bronze[**with elastomeric coating**].
6. Stem: Brass or bronze.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.

2.10 TRIM AND DRAIN VALVES

A. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
b. Fire Protection Products Inc (FPPI); a brand of Anvil International and Smith-Cooper International.
c. Fire-End & Croker Corporation.
d. Flowserve Corporation.
e. Jomar Valve.
f. KITZ Corporation.
g. Metso Automation USA Inc.

h. Milwaukee Valve Company.
i. NIBCO INC.
j. Potter Roemer LLC; a Division of Morris Group International.
k. Red-White Valve Corp.
l. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
m. Victaulic Company.
n. WATTS; A Watts Water Technologies Company.
o. Zurn Industries, LLC.

2. Description:

a. Pressure Rating: 175 psig.
b. Body Design: Two piece.
c. Body Material: Forged brass or bronze.
d. Port size: Full or standard.
e. Seats: PTFE.
f. Stem: Bronze or stainless steel.
g. Ball: Chrome-plated brass.
h. Actuator: Handlever.
i. End Connections for Valves NPS 1 through NPS 2-1/2: Threaded ends.
j. End Connections for Valves NPS 1-1/4 and NPS 2-1/2: Grooved ends.

B. Angle Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fire Protection Products Inc (FPPI); a brand of Anvil International and Smith-Cooper International.
b. NIBCO INC.
c. United Brass Works, Inc.

2. Description:

a. Pressure Rating: 175 psig.
b. Body Material: Brass or bronze.
c. Ends: Threaded.
d. Stem: Bronze.
e. Disc: Bronze.
f. Packing: Asbestos free.
g. Handwheel: Malleable iron, bronze, or aluminum.

C. Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. NIBCO INC.
b. United Brass Works, Inc.

2. Description:

a. Pressure Rating: 175 psig.
b. Body Material: Bronze with integral seat and screw-in bonnet.

c. Ends: Threaded.
d. Stem: Bronze.
e. Disc Holder and Nut: Bronze.
f. Disc Seat: Nitrile.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 INSTALLATION, GENERAL

A. Comply with requirements in the following Sections for specific valve-installation requirements and applications:

1. Section 211313 "Wet-Pipe Sprinkler Systems" for application of valves in wet-pipe, fire-suppression sprinkler systems.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply, except from fire-department connections. Install permanent identification signs, indicating portion of system controlled by each valve.

C. Install valves having threaded connections with unions at each piece of equipment arranged to allow easy access, service, maintenance, and equipment removal without system shutdown. Provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above the pipe center.

E. Install valves in position to allow full stem movement.

F. Install valve tags. Comply with requirements in Section 210553 "Identification for Fire-Suppression Piping and Equipment" for valve tags and schedules and signs on surfaces concealing valves; and the NFPA standard applying to the piping system in which valves are installed. Install permanent identification signs indicating the portion of system controlled by each valve.

END OF SECTION

SECTION 21 0529

HANGERS AND SUPPORTS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the fire protection drawings:

1) Metal pipe hangers and supports.
2) Trapeze pipe hangers.
3) Metal framing systems.
4) Thermal hanger-shield inserts.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 RELATED WORK

1. Section 21 0548 – Vibration and Seismic Controls for Fire-Suppression Piping and Equipment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

B. Pipe Welding Qualifications: Qualify procedures and operators according to 2015 ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for fire-suppression piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

B. NFPA Compliance: Comply with NFPA 13.

C. UL Compliance: Comply with UL 203.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: Factory-fabricated components, NFPA approved, UL listed, or FM approved for fire-suppression piping support.
2. Galvanized Metallic Coatings: Pregalvanized or hot-dip galvanized.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

B. Copper Pipe and Tube Hangers:

1. Description: Copper-coated-steel, factory-fabricated components, NFPA approved, UL listed, or FM approved for fire-suppression piping support.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with NFPA-approved, UL-listed, or FM-approved carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ABB, Electrification Business.
b. Cooper B-line; brand of Eaton, Electrical Sector.
c. Flex-Strut Inc.
d. G-Strut.
e. Haydon Corporation.
f. Unistrut; Atkore International.

g. Wesanco, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly, made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.
4. Channels: Continuous slotted carbon-steel channel with inturned lips.
5. Channel Width: Selected for applicable load criteria.
6. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anvil International/Smith-Cooper International; Tailwind Capital, LLC.
b. CADDY; brand of nVent Electrical plc.
c. Carpenter & Paterson, Inc.
d. Empire Industries, Inc.
e. PHD Manufacturing, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly, made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.
4. Channels: Continuous slotted [**carbon-steel**] <**Insert material**> channel with inturned lips.
5. Channel Width: Select for applicable load criteria.
6. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of [**carbon steel**] <**Insert material**>.

2.5 THERMAL HANGER-SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CADDY; brand of nVent Electrical plc.
2. Carpenter & Paterson, Inc.
3. National Pipe Hanger Corporation.
4. Pipe Shields Inc.
5. Piping Technology & Products, Inc.
6. Rilco Manufacturing Co., Inc.
7. Value Engineered Products, Inc.

B. Insulation-Insert Material: ASTM C552, Type II cellular glass with 100-psi or ASTM C591, Type VI, Grade 1 polyisocyanurate with 125-psi minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 MATERIALS

A. Aluminum: ASTM B221.

B. Carbon Steel: ASTM A1011/A1011M.

C. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; black and galvanized.

D. Stainless Steel: ASTM A240/A240M.

E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout, suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

A. Metal Pipe-Hanger Installation: Comply with installation requirements of approvals and listings. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A36/A36M carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal strut systems.

D. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Install lateral bracing with pipe hangers and supports to prevent swaying.

H. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms, and install reinforcing bars through openings at top of inserts.

I. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with 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. Finish welds at exposed connections, so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup:

1. Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

a. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

2. Cleaning and touchup painting of field welds, bolted connections, and abraded, shop-painted areas on miscellaneous metal are specified in Section 099123 "Interior Painting."

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with NFPA requirements for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.

G. Use copper-plated pipe hangers and [**copper**] [**or**] [**stainless-steel**] attachments for copper piping and tubing.

H. Use thermal hanger-shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Steel Pipe Clamps (MSS Type 4): For suspension of NPS 1/2 to NPS 24 if little or no insulation is required.
3. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
4. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
5. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
6. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
7. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
8. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
9. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Comply with NFPA requirements.

L. Building Attachments: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. C-Clamps (MSS Type 23): For structural shapes.
3. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

M. Saddles and Shields: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal Hanger-Shield Inserts: For supporting insulated pipe.

N. Comply with NFPA requirements for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

END OF SECTION

SECTION 21 0548

VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Contractor:

1. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the fire protection drawings:

    a. Elastomeric isolation pads.
    b. Elastomeric isolation mounts.
    c. Restrained elastomeric isolation mounts.
    d. Elastomeric hangers.
    e. Snubbers.
    f. Restraints - rigid type.
    g. Restraints - cable type.
    h. Restraint accessories.
    i. Post-installed concrete anchors.
    j. Concrete inserts.

B. Alternate Bids:

1. Alternate Bid No. 1: Does not apply.
2. Alternate Bid No. 2: Does not apply.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 22 0548 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for devices for plumbing equipment and systems.
2. Section 23 0548 "Vibration and Seismic Controls for HVAC" for devices for HVAC equipment and systems.

1.3 DEFINITIONS

A. Designated Seismic System: A fire-suppression component that requires design in accordance with ASCE/SEI 7, Ch. 13 and for which the Component Importance Factor is greater than 1.0.

B. IBC: International Building Code.

C. OSHPD: Office of Statewide Health Planning and Development (for the State of California).

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Include load rating for each wind-load-restraint fitting and assembly.
3. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component.
4. Annotate types and sizes of seismic restraints and accessories, complete with listing markings or report numbers and load rating in tension and compression as evaluated by ICC-ES product listing, UL product listing, OSHPD or an agency acceptable to authorities having jurisdiction.
5. Annotate to indicate application of each product submitted and compliance with requirements.
6. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated Design Submittal:

1. For each seismic-restraint device that is required by this Section submit the following:

    a. Seismic-Restraint Selection: Select seismic restraints complying with performance requirements, design criteria, and analysis data.
    b. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and seismic loads. Include certification by professional engineer that riser system was examined for excessive stress and that none exists.
    c. Post-Installed Concrete Anchors and Inserts: Include calculations showing anticipated seismic loads. Include certification that device is approved by an NRTL for seismic reinforcement use.
    d. Seismic Design Calculations: Submit all input data and loading calculations prepared under "Seismic Design Calculations" Paragraph in "Performance Requirements" Article.
    e. Qualified Professional Engineer: All designated-design submittals for seismic calculations are to be signed and sealed by qualified professional engineer responsible for their preparation.

2. Seismic-Restraint Detail Drawing:

   a. Design Analysis: To support selection and arrangement of seismic[**and wind**] restraints. Include calculations of combined tensile and shear loads.
   b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.

3. Product Listing, Preapproval, and Evaluation Documentation: By UL, OSHPD or an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).
4. All delegated design submittals for seismic-restraint detail Drawings are to be signed and sealed by qualified professional engineer responsible for their preparation.

D. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer and testing agency.

B. Field quality-control reports.

C. Seismic Qualification Data: Provide special certification for designated seismic systems as indicated in [**ASCE/SEI 7-05,**] [**ASCE/SEI 7-10,**] [**ASCE/SEI 7-16,**] Paragraph 13.2.2, "Special Certification Requirements for Designated Seismic Systems" for all Designated Seismic Systems identified as such on Drawings or in the Specifications.

   1. Provide equipment manufacturer's written certification for each designated active fire-suppression system seismic device and system, stating that it will remain operable following the design earthquake.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For seismic restraints to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.

B. Seismic-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: UL product listing or an agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic control system.

1. Seismic Performance: Equipment must be designed and secured to withstand the effects of earthquake motions determined in accordance with NFPA 13 and [**ASCE/SEI 7-05**] [**ASCE/SEI 7-10**] [**ASCE/SEI 7-16**] <**Insert requirement**>.

B. Seismic Design Calculations:

1. Perform calculations to obtain force information necessary to properly select seismic-restraint devices, fasteners, and anchorage. Perform calculations using methods acceptable to applicable code authorities and as presented in NFPA 13 and [**ASCE/SEI 7-05]** [**ASCE/SEI 7-10 including supplement No. 1**] [**ASCE/SEI 7-16**]. Where "ASCE/SEI 7" is used throughout this Section, it is to be understood that the edition referred to in this subparagraph is the edition intended as reference throughout the Section Text.

a. Data indicated below to be determined by Delegated Design Contractor must be obtained by Contractor and must be included in individual component submittal packages.
b. Building Occupancy Category: [**I**] [**II**] [**III**] [**IV**].
c. Building Risk Category: [**I**] [**II**] [**III**] [**IV**].
d. Building Site Classification: [**A**] [**B**] [**C**] [**D**] [**E**] [**F**].
e. Seismic Design Category: [**A**] [**B**] [**C**] [**D**] [**E**] [**F**].

C. Consequential Damage: Provide additional seismic and wind-load restraints for suspended fire-suppression system components or anchorage of floor-, roof-, or wall-mounted fire-suppression system components as indicated in [**ASCE/SEI 7-05**] [**ASCE/SEI 7-10**] [**ASCE/SEI 7-16**] so that failure of a non-essential or essential fire-suppression system component will not cause the failure of any other essential architectural, mechanical, or electrical building component.

D. Fire/Smoke Resistance: Seismic-[**and wind-load-**]restraint devices that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL in accordance with ASTM E84 or UL 723, and be so labeled.

E. Component Supports:

1. Load ratings, features, and applications of all reinforcement components must be based on testing standards of a nationally recognized testing agency.
2. All component support attachments must comply with force and displacement resistance requirements of [**ASCE/SEI 7-05 Section 13.6**] [**ASCE/SEI 7-10 Section 13.6**] [**ASCE/SEI 7-16 Section 13.6**].

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads: <**Insert drawing designation**>.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties. Neoprene rubber, silicone rubber, or other elastomeric material.
5. Surface Pattern: Smooth, ribbed, or waffle pattern.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Mounting Plates:

    a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded.

3. Elastomeric Material: Molded, oil- and water-resistant neoprene rubber, silicone rubber, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.

b. Mason Industries, Inc.

2. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

a. Housing: Cast-ductile iron or welded steel.
b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kinetics Noise Control, Inc.
b. Mason Industries, Inc.

2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
3. Damping Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel-to-steel contact.

2.6 SNUBBERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.

B. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Post-Installed Concrete Anchor Bolts: Secure to concrete surface with post-installed concrete anchors. Anchors to be seismically prequalified in accordance with ACI 355.2 testing and designated in accordance with [**ACI 318-08 Appendix D for 2009 IBC**] [**ACI 318-11 Appendix D for 2012 IBC**] [**ACI 318-14 Ch. 17 for 2015 or 2018 IBC**].
2. Preset Concrete Inserts: Seismically prequalified in accordance with ICC-ES AC446 testing.
3. Anchors in Masonry: Design in accordance with TMS 402.
4. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
5. Resilient Cushion: Maximum 1/4-inch air gap, and minimum 1/4 inch thick.

2.7 RESTRAINTS - RIGID TYPE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.

B. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2.8 RESTRAINTS - CABLE TYPE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.

B. Seismic-Restraint Cables: [**ASTM A1023/A12023M galvanized or ASTM A603 galvanized-steel**] [**ASTM A492 stainless steel**] cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic restraining cable service; with fittings attached by means of poured socket, swaged socket or mechanical (Flemish eye) loop.

C. Restraint cable assembly with cable fittings must comply with ASCE/SEI 19. All cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.9 RESTRAINT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.

B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Non-metallic stiffeners are unacceptable.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid restraints and restraint cables.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.10 POST-INSTALLED CONCRETE ANCHORS

A. Mechanical Anchor Bolts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.

2. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength for anchor and as tested according to ASTM E488/E488M.

B. Adhesive Anchor Bolts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.

2. Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.

C. Provide post-installed concrete anchors that have been prequalified for use in seismic applications. Post-installed concrete anchors must comply with all requirements of [**ASCE/SEI 7-05, Ch. 13**] [**ASCE/SEI 7-10, Ch. 13**] [**ASCE/SEI 7-16, Ch. 13**].

1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.

D. Expansion-type anchor bolts are not permitted for equipment in excess of 10 hp that is not vibration isolated.

1. Undercut expansion anchors are permitted.

2.11 CONCRETE INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.

B. Provide preset concrete inserts that are seismically prequalified in accordance with ICC-ES AC466 testing.

C. Comply with ANSI/MSS SP-58.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by OSHPD or an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry calculated static and seismic loads within specified loading limits.

3.3 INSTALLATION OF VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICES

A. Provide vibration-control devices for systems and equipment where indicated in Equipment Schedules or Fire-Suppression Vibration Isolation, Seismic, and Wind-Load-Restraint Schedule, where indicated on Drawings, or where the Specifications indicate they are to be installed on specific equipment and systems.

B. Provide seismic-restraint devices for systems and equipment where indicated in Equipment Schedules or Vibration Isolation, Seismic, and Wind-Load-Restraint Schedules, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.

C. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

D. Installation of vibration isolators and seismic restraints must not cause any stresses, misalignment, or change of position of equipment or piping.

E. Comply with installation requirements of NFPA 13 for installation of all seismic-restraint devices.

F. Equipment Restraints:

1. Install snubbers on fire-suppression equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
3. Install seismic-restraint devices using methods approved by OSHPD or an agency acceptable to authorities having jurisdiction that provides required submittals for component.

G. Piping Restraints:

1. Comply with all requirements in NFPA 13.
2. Design piping sway bracing in accordance with NFPA 13.

    a. Maximum spacing of all sway bracing to be no greater than indicated in NFPA 13.
    b. Design loading of all sway bracing not to exceed values indicated in NFPA 13.

H. Install seismic-restraint devices using methods approved by OSHPD or an agency acceptable to authorities having jurisdiction that provides required submittals for component.

I. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

J. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

K. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

L. Post-Installed Concrete Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other

embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors to be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive-Type Anchor Bolts: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross structural seismic joints and other points where differential movement may occur, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 211200 "Fire-Suppression Standpipes," Section 211313 "Wet-Pipe Sprinkler Systems," and Section 211316 "Dry-Pipe Sprinkler Systems" for piping flexible connections.

3.5 ADJUSTING

A. Adjust isolators after system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.

3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at no fewer than four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.

C. Remove and replace malfunctioning units and retest as specified above.

D. Units will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION

SECTION 21 0553

IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the fire protection drawings:

1) Warning signs and labels.
2) Pipe labels.
3) Valve tags.
4) Warning tags.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Valve-numbering scheme.

D. Valve Schedules: Provide for fire-suppression piping system. Include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Carlton Industries, LP.
3. Champion America.
4. Craftmark Pipe Markers.

5. LEM Products Inc.
6. Marking Services Inc.
7. National Marker Company.
8. Pipemarker.com; Brimar Industries, Inc.
9. Seton Identification Products; a Brady Corporation company.
10. Stranco, Inc.
11. emedco.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.

C. Letter and Background Color: As indicated for specific application under Part 3.

D. Maximum Temperature: Able to withstand temperatures of up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Arc-Flash Warning Signs: Provide arc-flash warning signs in locations and with content in accordance with requirements of OSHA and NFPA 70E[**, and other applicable codes and standards**].

J. Label Content: Include caution and warning information, plus emergency notification instructions.

2.2 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Carlton Industries, LP.
4. Champion America.
5. Craftmark Pipe Markers.
6. Kolbi Pipe Marker Co.
7. LEM Products Inc.
8. Marking Services Inc.
9. Pipemarker.com; Brimar Industries, Inc.
10. Seton Identification Products; a Brady Corporation company.
11. emedco.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.

C. Letter and Background Color: As indicated for specific application under Part 3.

D. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

E. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

F. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings. Also include the following:

1. Pipe size.
2. Flow-Direction Arrows: Include flow-direction arrows on[**main**] distribution piping. Arrows may be either integral with label or applied separately.

2.3 VALVE TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Carlton Industries, LP.
4. Champion America.
5. Craftmark Pipe Markers.
6. Kolbi Pipe Marker Co.
7. LEM Products Inc.
8. Marking Services Inc.
9. Pipemarker.com; Brimar Industries, Inc.
10. Seton Identification Products; a Brady Corporation company.
11. emedco.

B. Description: Stamped or engraved with 1/4-inch letters for piping-system abbreviation and 1/2-inch numbers.

1. Tag Material: [**Brass, 0.04 inch**] [**stainless steel, 0.024 inch**] [**aluminum, 0.031 inch**] [**or**] [**anodized aluminum, 0.031 inch**] thick, with predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass [**wire**] [**link chain**] [**beaded chain**] [**or**] [**S-hook**].

C. Letter and Background Color: As indicated for specific application under Part 3.

D. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Include valve-tag schedule in operation and maintenance data.

2.4 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Champion America.
3. Craftmark Pipe Markers.
4. Kolbi Pipe Marker Co.
5. LEM Products Inc.
6. Marking Services Inc.
7. Pipemarker.com; Brimar Industries, Inc.
8. Seton Identification Products; a Brady Corporation company.
9. emedco.

B. Description: Preprinted[**or partially preprinted,**] accident-prevention tags, of plasticized card stock[**with matte finish suitable for writing**].

1. Size: [**3 by 5-1/4 inches minimum**] [**Approximately 4 by 7 inches**] <**Insert dimensions**>.
2. Fasteners: [**Brass grommet and wire**] [**Reinforced grommet and wire or string**].
3. Nomenclature: Large-size primary caption, such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Letter and Background Color: As indicated for specific application under Part 3.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 INSTALLATION GENERAL REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. Locate identifying devices so that they are readily visible from the point of normal approach.

3.3 INSTALLATION OF EQUIPMENT LABELS, WARNING SIGNS, AND LABELS

A. Permanently fasten labels on each item of fire-suppression equipment.

B. Sign and Label Colors:

1. White letters on an ANSI Z535.1 safety-red background.

C. Locate equipment labels where accessible and visible.

D. Arc-Flash Warning Signs: Provide arc-flash warning signs on electrical disconnects and other equipment where arc-flash hazard exists, as indicated on Drawings, and in accordance with requirements of OSHA and NFPA 70E[**, and other applicable codes and standards**].

3.4 INSTALLATION OF PIPE LABELS

A. Install pipe labels showing service and flow direction with permanent adhesive on pipes.

B. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Within 3 ft. of each valve and control device.
2. At access doors, manholes, and similar access points that permit a view of concealed piping.
3. Within 3 ft. of equipment items and other points of origination and termination.
4. Spaced at maximum intervals of 25 ft. along each run. Reduce intervals to 10 ft. in areas of congested piping and equipment.

C. Flow- Direction Arrows: Provide arrows to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

D. Fire-Suppression Pipe Label Color Schedule:

1. Fire-Suppression Pipe Labels: White letters on an ANSI Z535.1 safety-red background.

3.5 INSTALLATION OF VALVE TAGS

A. Install tags on valves and control devices in fire-suppression piping systems. List tagged valves in a valve-tag schedule in the operating and maintenance manual. Include the identification "FSV" on all fire-suppression system valve tags.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below.

1. Valve-Tag Size and Shape:

a. Wet-Pipe Sprinkler System: 2 inches, round.

2. Valve-Tag Color: White letters on an ANSI Z535.1 safety-red background.

3.6 INSTALLATION OF WARNING TAGS

A. Warning Tag Color: Black letters on an ANSI Z535.1 safety-yellow background.

B. Attach warning tags, with proper message, to equipment and other items.

END OF SECTION

SECTION 21 1313

WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the fire protection drawings:

1) Steel pipe and fittings.
2) Copper tube and fittings.
3) Specialty valves.
4) Air vent.
5) Sprinkler piping specialties.
6) Sprinklers.
7) Pressure gauges.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the plumbing drawings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For wet-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

C. Delegated Design Submittals: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data, prepared by NICET Level III-certified technician, "Water-Based Systems Layout."

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler system plans and sections, or Building Information Model (BIM), drawn to scale, showing the items described in this Section and coordinated with all building trades.

B. Qualification Data: For qualified Installer and NICET certified technician.

C. Design Data: Approved sprinkler piping working plans, prepared according to NFPA 13, including documented approval by authorities having jurisdiction, and including hydraulic calculations if applicable.

D. Welding certificates.

E. Field Test Reports:

1. Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
2. Fire-hydrant flow test report.

F. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

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. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by NICET Level III-certified technician, "Water-Based Systems Layout."

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

1.7 FIELD CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of sprinkler service.
2. Do not proceed with interruption of sprinkler service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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.

B. Sprinkler system equipment, specialties, accessories, installation, and testing to comply with NFPA 13.

C. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

D. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wet-pipe sprinkler systems.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
2. Sprinkler Occupancy Hazard Classifications:

    a. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
    b. General Storage Areas: Ordinary Hazard, Group 1.
    c. Institutional: Light Hazard.
    d. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
    e. Offices, including Data Processing: Light Hazard.

3. Minimum Density for Automatic-Sprinkler Piping Design:

    a. Light-Hazard Occupancy: 0.10 gpm/sq. ft. over 1500 sq. ft. area.
    b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm/sq. ft. over 1500 sq. ft. area.
    c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm/sq. ft. over 1500 sq. ft. area.

E. Seismic Performance: Sprinkler piping to withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7. See Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

2.2 STEEL PIPE AND FITTINGS

A. Standard-Weight Steel Pipe: Black-steel pipe, ASTM A53/A53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Schedule 30 Steel Pipe: Black-steel pipe, ASTM A135/A135M; ASTM A795/A795M, Type E; or ASME B36.10M wrought steel, with wall thickness not less than Schedule 30 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.

C. Thinwall Steel Pipe: Black-steel pipe, ASTM A135/A135M or ASTM A795/A795M, threadable, with wall thickness less than Schedule 30 and equal to or greater than Schedule 10. Pipe ends may be factory or field formed to match joining method.

D. Schedule 10, Black-Steel Pipe: ASTM A135/A135M or ASTM A795/A795M, Schedule 10 in NPS 5 and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10, plain end.

E. Steel Pipe Nipples: Black steel, ASTM A733, made of ASTM A53/A53M, standard-weight, seamless steel pipe with threaded ends.

F. Steel Couplings: [**Galvanized**] [**and**] [**uncoated**] steel, ASTM A865/A865M, threaded.

G. Gray-Iron Threaded Fittings: [**Galvanized**] [**and**] [**uncoated**] gray-iron threaded fittings, ASME B16.4, Class 125, standard pattern.

H. Malleable- or Ductile-Iron Unions: UL 860.

I. Cast-Iron Flanges: ASME 16.1, Class 125.

J. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

1. Pipe-Flange Gasket Materials: [**AWWA C110, rubber, flat face, 1/8 inch thick**] [**ASME B16.21, nonmetallic and asbestos free**] [**or**] [**EPDM rubber gasket**].

    a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
    b. Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.

2. Metal, Pipe-Flange Bolts and Nuts: Carbon steel unless otherwise indicated.

K. Steel Welding Fittings: ASTM A234/A234M and ASME B16.9.

1. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

L. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International/Smith-Cooper International; Tailwind Capital, LLC.
    b. CPS Products, Inc.
    c. National Fittings, Inc.
    d. Shurjoint; a part of Aalberts Integrated piping Systems.
    e. Smith-Cooper International.
    f. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
    g. Victaulic Company.

2. Pressure Rating: 175-psig minimum.

3. Grooved-End Fittings for Steel Piping: [**Galvanized**] [**Painted**] [**Uncoated**] grooved-end fittings, ASTM A47/A47M, malleable-iron casting or ASTM A536, ductile-iron casting, with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

M. Steel Pressure-Seal Fittings: UL 213, FM Global-approved, 175-psig pressure rating with steel housing, rubber O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tools.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Victaulic Company.
b. Viega LLC.

2.3 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tube: ASTM B88, Type K.

B. Cast-Copper, Solder-Joint Fittings: ASME B16.18 pressure fittings.

C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22 pressure fittings.

D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

E. Cast Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

F. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

G. Copper-Tube, Mechanically Formed Tee Fitting: For forming T-branch on copper water tube.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. T-DRILL Industries Inc.

2. Description: Tee formed in copper tube according to ASTM F2014.

H. Grooved, Mechanical-Joint, Copper-Tube Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anvil International/Smith-Cooper International; Tailwind Capital, LLC.
b. Shurjoint; a part of Aalberts Integrated piping Systems.
c. Victaulic Company.

2. Standard: UL 213.
3. Grooved-End Copper Fittings: ASTM B75 copper tube or ASTM B584 bronze castings.
4. Grooved-End-Tube Couplings: To fit copper tube dimensions; rigid pattern unless otherwise indicated; gasketed fitting EPDM-rubber gasket rated for minimum [**180 deg F**]

<**Insert temperature**> for use with ferrous housing and steel bolts and nuts; 300 psig minimum CWP pressure rating.

I. Copper-Tube, Pressure-Seal-Joint Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Viega LLC.

2. Fittings: Cast-brass, cast-bronze, or wrought-copper with EPDM O-ring seal in each end.
3. Minimum 200-psig working-pressure rating at 250 deg F.

2.4 SPECIALTY VALVES

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

B. Pressure Rating:

1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.

C. Body Material: Cast or ductile iron.

D. Size: Same as connected piping.

E. End Connections: Flanged or grooved.

F. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Reliable Automatic Sprinkler Co., Inc. (The).
   b. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.

2. Standard: UL 1726.
3. Pressure Rating: 175-psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4.
6. End Connections: Threaded.

2.5 AIR VENT

A. Manual Air Vent/Valve:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AGF Manufacturing, Inc.
   b. National Fittings, Inc.
   c. Shurjoint; a part of Aalberts Integrated piping Systems.
   d. Victaulic Company.

2. Description: Ball valve that requires human intervention to vent air.
3. Body: Forged brass.
4. Ends: Threaded.
5. Minimize Size: 1/2 inch.
6. Minimum Water Working Pressure Rating: 300 psig.

B. Automatic Air Vent:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AGF Manufacturing, Inc.
   b. CLA-VAL.
   c. Engineered Corrosion Solutions.
   d. Metraflex Company (The).
   e. Val-Matic Valve & Manufacturing Corp.

2. Description: Automatic air vent that automatically vents trapped air without human intervention.
3. Standard: UL listed or FM Global approved for use in wet-pipe fire sprinkler systems.
4. Vents oxygen continuously from system.
5. Float valve to prevent water discharge.
6. Minimum Water Working Pressure Rating: 175 psig.

C. Automatic Air Vent Assembly:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AGF Manufacturing, Inc.
   b. Engineered Corrosion Solutions.
   c. Potter Electric Signal Company, LLC.
   d. South-Tek Systems, LLC.

2. Description: Automatic [**dual**]air vent assembly that automatically vents trapped air without human intervention, including Y-strainer and ball valve in a pre-piped assembly.
3. Standard: UL listed or FM Global approved for use in wet-pipe fire sprinkler system.
4. Vents oxygen continuously from system.
5. Float valve to prevent water discharge.
6. Minimum Water Working Pressure Rating: 175 psig.

2.6 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AGF Manufacturing, Inc.
   b. Anvil International/Smith-Cooper International; Tailwind Capital, LLC.
   c. National Fittings, Inc.
   d. Shurjoint; a part of Aalberts Integrated piping Systems.
   e. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.

f. Victaulic Company.

2. Standard: UL 213.
3. Pressure Rating: 175-psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-tee and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGF Manufacturing, Inc.
b. Reliable Automatic Sprinkler Co., Inc. (The).
c. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
d. Victaulic Company.

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded or grooved.

C. Branch Line Testers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGF Manufacturing, Inc.
b. Elkhart Brass Mfg. Co., Inc.
c. Fire-End & Croker Corporation.
d. Potter Electric Signal Company, LLC.
e. Potter Roemer LLC; a Division of Morris Group International.

2. Standard: UL 199.
3. Pressure Rating: 175 psig.
4. Body Material: Brass.
5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGF Manufacturing, Inc.
b. Triple R Specialty.

c. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
d. Victaulic Company.
e. Viking Group Inc.

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

E. Adjustable Drop Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Aegis Technologies, Inc.
b. CECA, LLC.
c. CPS Products, Inc.
d. Merit Manufacturing.

2. Standard: UL 1474.
3. Pressure Rating: 250-psig minimum.
4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

2.7 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Globe Fire Sprinkler Corporation.
2. Reliable Automatic Sprinkler Co., Inc. (The).
3. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
4. Venus Fire Protection Ltd.
5. Victaulic Company.
6. Viking Group Inc.

B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

C. Pressure Rating for Residential Sprinklers: 175-psig maximum.

D. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

E. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.
2. Nonresidential Applications: UL 199.
3. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

F. Sprinkler Finishes: Chrome plated [**painted**].

G. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, one piece, flat.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

H. Sprinkler Guards:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Reliable Automatic Sprinkler Co., Inc. (The).
b. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
c. Victaulic Company.
d. Viking Group Inc.

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.8 PRESSURE GAUGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AGF Manufacturing, Inc.
2. AMETEK, Inc.
3. Ashcroft Inc.
4. Brecco Corporation.
5. WIKA Instrument Corporation.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gauge Range: 0- to 250-psig minimum.

E. Label: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13. In seismic-rated areas, refer to Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

J. Install pressure gauges on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gauges with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they are not subject to freezing.

K. Fill sprinkler system piping with water.

L. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

M. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

N. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.2 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

I. Steel-Piping, Pressure-Sealed Joints: Join [**lightwall**] [**and**] [**Schedule 5**] steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

M. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

N. Copper-Tubing Grooved Joints: Roll rounded-edge groove in end of tube according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

O. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and copper pressure-seal fittings with tools recommended by fitting manufacturer.

P. Extruded-Tee Connections: Form tee in copper tube according to ASTM F2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

Q. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 INSTALLATION OF COVER SYSTEM FOR SPRINKLER PIPING

A. Install cover system, brackets, and cover components for sprinkler piping according to manufacturer's "Installation Manual" and NFPA 13 or NFPA 13R for supports.

3.4 INSTALLATION OF VALVES AND SPECIALTIES

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. Install valves in vertical position for proper direction of flow, in main supply to system.
2. Install alarm valves with bypass check valve and retarding chamber drain-line connection.
3. Install deluge valves in vertical position, in proper direction of flow, and in main supply to deluge system. Install trim sets for drain, priming level, alarm connections, ball drip valves, pressure gauges, priming chamber attachment, and fill-line attachment.

E. Air Vent:

1. Provide at least one air vent at high point in each wet-pipe sprinkler system in accordance with NFPA 13 requirements. Connect vent into top of fire sprinkler piping.
2. Provide dielectric union for dissimilar metals, ball valve, and strainer upstream of automatic air vent.
3. Pipe from outlet of air vent to drain.

3.5 INSTALLATION OF SPRINKLERS

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.

3.6 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Coordinate with fire-pump tests. Operate as required.
7. Verify that equipment hose threads are same as local fire department equipment.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

3.10 PIPING SCHEDULE

A. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

B. Copper-tube, extruded-tee connections may be used for tee branches in copper tubing instead of specified copper fittings. Branch-connection joints must be brazed.

C. Standard-Pressure, Wet-Pipe Sprinkler System to Be One of the Following:

1. Standard-weight or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight or Schedule 30, black-steel pipe with plain ends; uncoated, plain-end-pipe fittings; and twist-locked joints.
3. Standard-weight or Schedule 30, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
4. Standard-weight or Schedule 30, black-steel pipe with plain ends; steel welding fittings; and welded joints.
5. Thinwall Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
6. Thinwall Schedule 10 black-steel pipe with plain ends; uncoated, plain-end-pipe fittings; and twist-locked joints.
7. Thinwall Schedule 10 black-steel pipe with plain ends; welding fittings; and welded joints.
8. Type L, hard copper tube with plain ends; [**cast-**] [**or**] [**wrought-**]copper, solder-joint fittings; and brazed joints.

9. Type L, hard copper tube with plain ends; copper pressure-seal fittings; and pressure-sealed joints.
10. NPS 2, Type L, hard copper tube with roll-grooved ends; copper, grooved-end fittings; grooved-end-tube couplings; and grooved joints.

3.11 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Concealed sprinklers.
3. Wall Mounting: Sidewall sprinklers.
4. Special Applications: Institutional space sprinklers.

END OF SECTION

SECTION 22 0500

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing and testing of the material described within this specification as outlined on the Plumbing drawings.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 SCOPE

A. This section includes information common to two or more technical plumbing specification sections or items that are of a general nature, not conveniently fitting into other technical sections. Included are the following topics:

1. PART 1 - GENERAL

a. Scope
b. Related Work
c. Standards
d. Quality Assurance
e. Continuity of Existing Services
f. Protection of Finished Surfaces
g. Sleeves and Openings
h. Sealing and Firestopping
i. Off Site Storage
j. Codes
k. Certificates and Inspections
l. Submittals
m. Operating and Maintenance Instructions
n. Training of Owner Personnel
o. Record Drawings
p. Scheduling
q. Data and Drawings
r. Electrical Coordination

2. PART 2 - PRODUCTS

a. Access Panels and Doors
b. Identification
c. Bedding and Backfill
d. Firestopping
e. Sealing

f. Drip Pans

3. PART 3 - EXECUTION

a. Demolition
b. Excavation and Backfill
c. Sheeting, Shoring and Bracing
d. Dewatering
e. Rock Excavation
f. Surface Restoration
g. Cutting and Patching
h. Building Access
i. Equipment Access
j. Coordination
k. Identification
l. Lubrication
m. Sleeves
n. Sealing and Firestopping
o. Storage and Handling
p. Paint

1.3 RELATED WORK

A. Specified elsewhere:

1. Applicable provisions of Division 01 govern work under this section.
2. Section 05 05 20 - Fasteners and Metal Fastenings
3. Section 07 84 00 - Firestopping
4. Section 09 91 00 - Painting of Piping Systems
5. Division 21 - Fire Suppression Systems
6. Division 23 - Heating and Air Conditioning
7. Division 26 - Electrical

B. This section applies to all Division 22 00 00 sections of plumbing.

1.4 STANDARDS

A. Provide all materials and equipment under this contract in accordance with the following applicable Technical Society, Organization, or Body. Abbreviations of standards organizations referenced in this and other sections are as follows:

1. ADA - Americans With Disabilities Act (1990)
2. AGA - American Gas Association
3. ANSI - American National Standards Institute
4. ASME - American Society of Mechanical Engineers
5. ASSE - American Society of Sanitary Engineering
6. ASTM - American Society for Testing and Materials
7. AWWA - American Water Works Association
8. AWS - American Welding Society
9. CISPI - Cast Iron Soil Pipe Institute
10. CGA - Compressed Gas Association
11. CDA - Copper Development Association
12. CS - Commercial Standards, Products Standards Sections, Office of Eng. Standards Service, NBS
13. EPA - Environmental Protection Agency
14. FM - Factory Mutual
15. IDPH - Illinois Department of Public Health

16. IEEE - Institute of Electrical and Electronics Engineers
17. ISA - Instrument Society of America
18. MICA - Midwest Insulation Contractors Association
19. MSS - Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
20. NBS - National Bureau of Standards
21. NEC - National Electric Code
22. NEMA - National Electrical Manufacturers Association
23. NFPA - National Fire Protection Association
24. NSF - National Sanitation Foundation
25. OSHA - Occupational Safety and Health Act
26. PDI - Plumbing and Drainage Institute
27. UL - Underwriters Laboratories Inc.
28. WQA - Water Quality Association

B. Reference to Standards shall mean and intend the latest edition of specifications adapted and published at the time of invitation to submit proposals. Standards referenced in this section:

1. ASTM D1557 - Standard Test Method for Moisture-Density Relations of Soils
2. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops
3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
4. UL1479 - Fire Tests of Through-Penetration Firestops
5. UL723 - Surface Burning Characteristics of Building Materials

1.5 QUALITY ASSURANCE

A. Refer to Division 01, General Conditions, Equals and Substitutions.

B. All products and materials, of first quality of manufacturers, used are to be new, undamaged, clean and in good condition. Existing products and materials are not to be reused unless specifically indicated.

C. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the intended performance from the system into which these items are placed.

D. Plumbing work shall be installed in strict conformity with the specifications and applicable State and local codes and ordinances.

1. The rules of the State of Illinois Department of Public Health shall be part of this specification and are hereby incorporated by reference.
2. If the requirements of the applicable State and local codes and ordinances are contrary to or more stringent than the requirements of the specification, the requirements of the codes and ordinances shall govern.

E. Installation shall be by qualified personnel thoroughly trained and experienced in skills required and completely familiar with the manufacturer's current recommended methods of installation as well as the requirements of the work. System shall be ready for satisfactory use.

1.6 CONTINUITY OF EXISTING SERVICES

A. Do not interrupt or change existing services without prior written approval from the Owner and the Architect's Representative. When interruption is required, coordinate scheduling of down-time with the Owner to minimize disruption to his activities. Unless specifically stated, all work involved in interrupting or changing existing services is to be done during normal working hours.

B. The existing buildings will be occupied and maintained in normal use by the Owner during the progress of these contracts.

C. Schedule work to reduce to the minimum the period of interruption or outages to the various services.

D. Notify the Owner and the Architect, no less than 120 hours before any system is to be put out of service, of the extent of the work to be done during the outage, the probable length of time required for that phase of the work, and the desired time at which the outage is to begin.

1.7 PROTECTION OF FINISHED SURFACES

A. Refer to Division 01, General Requirements, Protection of Finished Surfaces.

1.8 SLEEVES AND OPENINGS

A. Refer to Section 22 05 00, Article 3.14 SLEEVES.

1.9 SEALING AND FIRESTOPPING

A. Sealing between piping, etc. and the non-rated partition opening shall be the responsibility of the contractor whose work penetrates the opening. Seal all openings with caulk sealant or another approved product.

B. General Contractor is responsible for firestopping. See Section 07 84 00. This Trade and the Firestopping Trade shall coordinate and be held equally responsible for achieving installations consistent with the required firestop listing.

1.10 OFF SITE STORAGE

A. Prior approval by the Architect/Engineer will be needed. The Contractor shall submit a written request for consideration of off site materials storage. Generally, sleeves, pipe/pipe fittings and similar rough-in material will not be accepted for off site storage. No material will be accepted for off site storage unless shop drawings for the material have been approved.

1.11 CODES

A. Comply with requirements of Part 890 Illinois Plumbing Code, Illinois Department of Public Health.

1.12 CERTIFICATES AND INSPECTIONS

A. Refer also to Division 01, General Conditions, Permits, Regulations, Utilities and Taxes.

B. Obtain and pay for all required State installation inspections except those provided by the Owner or Architect/Engineer in accordance with IDPH, State and Local Codes, Ordinances, and Authorities with Jurisdiction. Include copies of the certificates in the Operating and Maintenance Instructions.

C. The installing contractor is required to certify in writing the installations of the systems and equipment. (See Conditions of Contract regarding progress payments defining Substantial Completion and Section 01 70 00 Project Closeout for certification requirements.) In compliance with the Illinois Department of Public Health (IDPH) requirements, the installing contractor shall certify that, to the best of his knowledge, the following has been completed:

1. The plumbing has been installed, complying with the specifications, and with National, State, and Local Codes.
2. Smoke and fire separation penetrations have been installed in accordance with the UL assembly requirements and in accordance with the product manufacturer's requirements.
3. Each Contractor is required to supply the appropriate support documentation and UL listings to substantiate the certifications.

1.13 SUBMITTALS

A. Refer to Division 01, General Conditions, Submittals.

B. Not more than two weeks after award of contract but before any shop drawings are submitted, contractor to submit the following plumbing system data sheet. List piping material type for each piping service on the project, ASTM number, schedule or pressure class, joint type, manufacturer and model number where appropriate. List valves and specialties for each piping service, fixture and equipment with manufacturer and model number.

C. The approved plumbing system data sheet(s) will be made available to the Project Representative for their use on the project.

PLUMBING SYSTEM DATA SHEET

Item	Pipe Service/Sizes	Manufacturer/Model No.	Remarks
Pipe			
Fittings			
Unions			
Valves:			
Ball			
Butterfly			
Balancing			
Check			
Gate			
Pipe Specialties:			
Thermometers			
Press Gauges			
Strainers			
Building Penetrations			
Hangers and Supports			
Concrete Anchors			
Insulation			
Plbg. Specialties:			
Floor/Roof Drains			
Cleanouts			
Water Hammer Arrestors			
Backflow Preventers			
Wall/Yard Hydrants			
Hose Bibbs			
Plbg. Fixtures			
All Smoke/Fire Rated Wall and Floor Sleeve Assemblies			

D. Shop drawing submittals are to be bound, labeled, contain the project manual cover page and a material index list page showing item designation, manufacturer and additional items supplied with the installation. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Include wiring diagrams of electrically powered equipment.

E. Shop drawings for any material or product use in the plumbing system which does not comply with the requirements of Part 890 shall include a copy of the Illinois Department of Public Health approval letter.

F. Submit 4 copies of water test report.

G. Submit 2 copies of final inspection report from District Plumbing Inspector.

H. Before submitting electrically powered equipment, verify that the electrical power and control requirements for the equipment are in agreement with the motor starter schedule on the electrical drawings. Include a statement on the shop drawing transmittal to the Architect/Engineer that the equipment submitted and the motor starter schedule are in agreement or indicate any discrepancies. See related comments in Section 22 05 13 and Section 22 05 00, Article 1.19 Electrical Coordination.

1.14 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Refer to Division 01, General Requirements, Operating and Maintenance Instructions.

B. Assemble material in three-ring or post binders, using an index at the front of each volume and tabs for each system or type of equipment. In addition to the data indicated in the General Requirements, include the following information:

1. Copies of all approved shop drawings.
2. Manufacturer's wiring diagrams for electrically powered equipment.
3. Records of tests performed to certify compliance with system requirements.
4. Certificates of inspection by regulatory agencies.
5. Parts lists for fixtures, equipment, valves and specialties.
6. Manufacturer's installation, operation and maintenance recommendations for fixtures, equipment, valves and specialties.
7. Valve schedules.
8. Lubrication instructions, including list/frequency of lubrication.
9. Warranties.
10. Additional information as indicated in the technical specification sections.
11. Reconditioning schedule of replaced parts, room numbers, etc. completed and signed by person doing reconditioning work.
12. Approved copy of backflow preventer registration from Illinois Department of Public Health.

1.15 TRAINING OF OWNER PERSONNEL

A. Instruct user agency personnel in the proper operation and maintenance of systems and equipment provided as part of this project. Include not less than ___ hours of instruction, using the Operating and Maintenance manuals during this instruction. Demonstrate startup, operation and shutdown procedures for all equipment. All training to be during normal working hours. Provide a letter signed by the Owner indicating completion of training.

1.16 RECORD DRAWINGS

A. Refer to Division 01, General Requirements, Record Drawings.

B. Refer to Division 01, Section 01 70 00, Execution and Closeout Requirements.

1.17 SCHEDULING

A. Install all sewers and drains below grade as soon after the award of contract as possible. Start underground work immediately after building excavations are made.

B. Install general plumbing work as fast as construction progress permits.

1.18 DATA AND DRAWINGS

A. See Instructions to Bidders regarding examination of site and special site conditions.

B. The information given herein and on the drawings is as exact as can be secured. Its accuracy is not guaranteed. Examination of site will be required to verify all measurements, distances, levels, and elevations before starting the work.

C. If any omissions or discrepancies occur between the drawing and actual site conditions, the Architect shall be notified for clarification.

D. The location of piping, fixtures, or equipment which is governed by architectural features shall be established by reference to dimensions on architectural structural drawings. THE DRAWINGS SHALL NOT BE SCALED FOR EXACT DIMENSIONS. Consult complete drawings and details for dimensions of all partitions, their construction, and location in relation to plumbing fixtures.

E. The approximate locations of all fixtures, equipment, and piping are shown on the drawings. The Architect reserves the right to change the location of any fixtures and equipment 5 feet and piping 10 feet in any direction without these changes being made subject of an extra charge, provided such changes are made before the rough in, piping, or sleeves have been installed.

F. Changes of the drawing necessary to make the plumbing systems conform to the building as constructed and to fit the work of other trades shall be made without extra cost.

G. Deviations or changes in location of fixtures, equipment, and/or piping made in the field shall be carefully recorded on field set of drawings and the Architect shall be informed of all deviations and changes. Submit (2) two sets of as-built drawings per Section 01 70 00.

H. Where demolition and remodeling work require removal and/or relocation of existing fixtures, equipment or trim, the Plumbing Contractor shall include same as part of his contract work.

1.19 ELECTRICAL COORDINATION

A. Unless otherwise specified, the Electrical Trade shall furnish and install electrical feeders of proper size, the disconnects or manual starters, the magnetic starters or contactors with integral or remote pushbutton stations where required, and all power wiring including final connections for each motor.

B. For equipment with integral starters or multiple starters and motors on the unit, the Electrical Trade shall wire to the line side of the starter or one set of terminal blocks. The wiring on the load side of starters or terminal block shall be factory wired or field wired to all other required terminals in the unit by the Plumbing Trade.

C. The Electrical Trade shall furnish the power wiring and conduit shown on the electrical drawings. All other wiring required for the plumbing system shall be furnished by the Plumbing Trade. All control wiring, conduit and junction boxes to be provided by Plumbing Trade. Control wiring to include controls for equipment, sensors, medical gas alarm panels, electronic sensor faucets, etc. See Section 26 05 33 - Raceway and Boxes.

D. Consult with the Electrical Trade before the installation of equipment to coordinate the motor type, voltage and sizes with the starter type voltage and sizes, holding coil voltage, thermal overload

capacities, interlocks, etc. The Plumbing Trade and the Electrical Trade shall be equally responsible to ensure that the equipment installed is of proper size, etc.

PART 2 - PRODUCTS

2.1 ACCESS PANELS AND DOORS

A. Lay-In Ceilings

1. Removable lay-in ceiling tiles in 2 x 2 foot or 2 x 4 foot configuration provided under Section 09 51 13 are sufficient; no additional access provisions are required unless specifically indicated.

B. Concealed Spline Ceilings

1. Removable sections of ceiling tile held in position with metal slats or tabs compatible with the ceiling system used will be provided under Section 09 51 13.

C. Metal Pan Ceilings

1. Removable sections of ceiling tile held in position by a pressure fit will be provided under Section 09 51 13.

D. Plaster Walls and Ceilings

1. 16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver operated cam latch for general applications, key lock for use in public or secured areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the item needing service. Use 18" x 18" unless space limitations require a smaller panel.

E. Where remodeling creates inaccessibility of existing valves, equipment, the Plumbing Contractor shall provide access panels as specified above.

2.2 IDENTIFICATION

A. Engraved Name Plates

1. White letters on a black background, 1/16" thick plastic laminate, beveled edges, screw mounting, Setonply Style 2060 by Seton Name Plate Company, Emedolite Style EIP by EMED Co., W.H. Brady, or Marking Services.

B. Snap-Around Pipe Markers

1. One-piece, preformed, vinyl construction, snap-around or strap-around pipe markers with applicable labeling and flow direction arrows, 3/4" minimum size for lettering. Provide nylon ties on each end of pipe markers. Equal to Seton Setmark.

C. Valve Tags

1. Valve tags to identify project name and valve number. Provide (2) two tags - per valve, if necessary. Round brass tags with 1/2" numbers, 1/4" system identification abbreviation, 1 1/4" minimum diameter, with brass jack chains, brass "S" hooks or one piece nylon ties around the valve stem, available from EMED Co., Seton Name Plate Company, or W.H. Brady.

2. Indexing sheets for valve numbers shall be typewritten, encased in a transparent case and frame, and posted in main service room of building or as directed. Provide Architect with two (2) copies of index sheets.

   a. If valve numbers are to be added to an existing system, the numbers shall be verified with the Owner as to the number and system abbreviation. THIS VERIFICATION SHALL BE COMPLETED BEFORE MATERIAL IS ORDERED.

D. Underground Warning Tape

1. Detectable underground warning tape, 5.0 mil overall thickness, 6" width, .0035" thick aluminum foil core with polyethylene jacket bonded to both sides. Color code tape and print caution along with name of buried service in bold letters on face of tape. Thor Enterprises Magnatec or equal by Carlton, MSI Marking Services, Seton.

E. Tracer Wire

1. Install tracer wire or an equivalent means to locate all non-metallic water mains or sewers that connect to any municipality main - per Wisconsin Statute 182.0715(2r).
2. Provide 12 gauge HDPE insulated high strength (HS) copper-clad steel wire buried 6" above the top of pipe. Acceptable Manufacturer: Copperhead Industries, LLC. or equal.
3. Securely attach tracer wire a minimum of (3) three times for each length of pipe. A tracer wire shall be brought to grade at hydrants, valve boxes or every 400 ft. with a magnetized tracer box.
4. Splices and typical connection devices, ie: solder, crimp connection, split bolt connection, etc. to be used per manufacturer's recommendations.
5. Color code system tracer boxes and wiring per American Public Works Assoc. (APWA) standards.
6. After contractor has completed all water/sewer pipe installation, system shall be tested for electrical continuity. Contractor is responsible for all costs required to establish the electrical continuity of tracer wire circuit.

2.3 BEDDING AND BACKFILL

A. Bedding up to a point 12" above the top of the pipe shall be thoroughly compacted sand or crushed stone chips meeting the following gradations:

Gradation for Bedding Sand		Gradation for Crushed Stone Chip Bedding	
Sieve Size	% Passing (by Wt)	Sieve Size	% Passing (by Wt)
1 inch	100	1/2 inch	100
No. 16	45 - 80	No. 4	75 - 100
No. 200	2 - 10	No. 100	10 - 25

B. Backfill above the bedding in lawn areas shall be thoroughly compacted excavated material free of large stones, organic, perishable, and frozen materials.

C. Backfill above the bedding under existing and future utilities, paving, sidewalks, curbs, roads and buildings shall be granular materials, pit run sand, gravel, or crushed stone, free from large stones, organic, perishable, and frozen materials.

2.4 FIRESTOPPING - By General Trade. See Specification Section 07 84 00.

2.5 SEALING

A. In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the uninsulated pipe

and the cored opening or a water-stop type wall sleeve. The operating bolts of the mechanical type seal shall be accessible from the interior of the building. Thunderline Corp. "Link-Seal" or approved equal waterproofing system for pipe and sleeve.

B. At pipe penetrations of non-rated interior partitions, floors and exterior walls, use urethane caulk in annular space between pipe insulation and sleeve. For non-rated drywall, plaster or wood partitions where sleeve is not required, use urethane caulk in annular space between pipe insulation and wall material.

2.6 DRIP PANS

A. Over connected electrical equipment and other critical areas, as noted on drawings, furnish and install water tight pans below soil, waste, roof conductors, clearwater drains, and all water piping. Pans shall be a minimum of 12" wide for single pipe served. Multiple piping racks shall have pans 4" wider on both sides of outside pipes. Pans shall be at least 6" deep constructed of 18" gauge sheet aluminum, with all joints sealed watertight.

PART 3 - PRODUCTS

3.1 DEMOLITION

A. Perform all demolition as indicated on the drawings to accomplish new work. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the Owner to minimize disruption to the existing building occupants.

B. All pipe, fixtures, equipment, wiring and associated conduit, insulation and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor except as specifically noted otherwise. All designated equipment is to be turned over to the user agency for their use at a place and time so designated. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began.

C. Demolition of floor and/or hub drains shall include the removal of the drain body, p-trap and capping the horizontal waste. This applies to accessible waste piping at basement ceiling. Where drains are located in slab construction on grade, the drain with strainer and p-trap shall be removed and capped below slab. Cutting of slabs shall be work by This Trade. Patching and restoring shall be work by the General Contractor.

D. Wall rough-in for sinks, lavatory, and like fixtures where wall construction is to remain shall include capping waste and water supplies behind the finished wall surface.

E. Where remodeling of floor and walls involves exposing existing stacks, risers and/or rough in of services, same shall be verified and disconnected from mains below floor and above finished ceilings or relocated as required to maintain a working system. In all cases, the Contractor shall verify final quantities of demolition work and complete the required changes to the present system design to maintain the system in working condition.

F. Chasing of existing walls for new plumbing piping shall be done by This Trade. See Division 01, Section 01 00 00 for patching and restoring.

G. Provide documentation to Owner for any backflow preventer unit(s) removed from building. Include number and location of backflow preventer unit.

3.2 EXCAVATION AND BACKFILL

A. Perform all excavation and backfill work necessary to accomplish indicated plumbing systems installation. Excavate to bottom of pipe and structure bedding, 4" in stable soils, 6" in rock or wet trenches and 8" in unstable soil. Finish bottoms of excavations to true, level surface. All trenching excavations shall be open trench method, unless otherwise noted.

B. Tunnel or remove sidewalk and curb in areas of excavation to the nearest joint. Remove pavements, curbs and gutters to neat and straight lines to the limits of removal. Make sawcut lines parallel to existing joints, or parallel or perpendicular to pavement edges to form a neat patch. Carefully remove remaining pavement within the sawcut area. Leave existing base materials between the area disturbed by the work and the sawcut line undisturbed by the sawcutting, pavement removal, or pavement replacement processes.

C. Strip topsoil from area to be excavated, free from subsoil and debris, and store for later respreading.

D. At no time place excavated materials where they will impede surface drainage unless such drainage is being safely rerouted away from the excavation.

E. Excavate whatever materials are encountered as required to place at the elevations shown, all pipe, manholes, and other work. Remove debris and rubbish from excavations before placing bedding and backfill material.

F. Remove surplus excavated materials from site.

G. Verify the locations of any water, drainage, gas, sewer, electric, telephone or steam lines which may be encountered in the excavation. Underpin and support all lines. Cut off service connections encountered which are to be removed at the limits of the excavation and cap. In the event of a break in an existing utility main or service, notify immediately an official from the utility interrupted, lend all possible assistance in restoring the service, and assume costs or claims connected with the interruption and repair of utility break.

H. Provide and maintain all fencing, barricades, signs, warning lights, and/or other equipment necessary to keep all excavation pits and trenches and the entire subgrade area safe under all circumstances and at all times. No excavation shall be left unattended without adequate protection.

I. Elevations shown on the plans are subject to such revisions as may be necessary to fit field conditions. No adjustment in compensation will be made for adjustments up to two (2) feet above or below the grades indicated on the plans.

J. Install lines passing under foundations with minimum of 1-1/2" clearance to concrete and ensure there is no disturbance of bearing soil.

K. Bed pipe up to a point 12" above the top of the pipe. Take care during bedding, compaction and backfill not to disturb or damage piping.

L. Mechanically compact bedding and backfill to prevent settlement. The initial compacted lift to not exceed 24" compacted to 95% density per Modified Proctor Test (ASTM D-1557). Subsequent lifts under pavements, curbs, walks and structures are not to exceed 12" and be compacted to 95% density per Modified Proctor Test. In all other areas where construction above the excavation is not anticipated within 2 years, mechanically compact backfill in lifts not exceeding 24" to 90% density per Modified Proctor Test. Route the equipment over each lift of the material so that the compaction equipment contacts all areas of the surface of the lift.

3.3 SHEETING, SHORING AND BRACING

A. Provide shoring, sheet piling and bracing in conformance with the Wisconsin Administrative Code to prevent earth from caving or washing into the excavation. Shore and underpin to properly support

adjacent or adjoining structures. Abandon in place shoring, sheet piling and underpinning below the top of the pipe, or, if approved in advance by the engineer, maintained in place until other permanent support approved by the engineer is provided.

3.4 DEWATERING

A. Provide, operate, and maintain all pumps and other equipment necessary to drain and keep all excavation pits, trenches and the entire subgrade area free from water under all circumstances. Obtain general permit from the Wisconsin Department of Natural Resources district office for discharge of construction dewatering effluent. Obtain well permit from the Wisconsin Department of Natural Resources district office for dewatering wells discharging more than 70 GPM. Comply with permit requirements.

3.5 ROCK EXCAVATION

A. Remove rock encountered in the excavation to a minimum dimension of 6" outside the pipe. Rock excavation includes all hard, solid rock in ledges, bedded deposits and unstratified masses, all natural conglomerate deposits so firmly cemented as to present all the characteristics of solid rock; which material is so hard or so firmly cemented that in the opinion of the Engineer it is not practical to excavate and remove same with a power shovel except after thorough and continuous drilling and blasting. Rock excavation includes rock boulders of 1/2 cubic yard or more in volume.

B. Rock excavation will be computed on the basis of the depth of rock removed and a trench width two (2) feet larger than the outside diameter of the pipe where one (1) pipe is laid in the trench and three (3) feet larger than the combined outside diameter where two (2) pipes are laid in the trench. Include 6" pipe and structure bedding in rock excavation. Include rock excavation shown on the plans in the Base Bid.

3.6 SURFACE RESTORATION

A. Completely restore the surface of all disturbed areas to a like condition of the surface prior to the work. Level off all waste disposal areas and clean up all areas used for the storage of materials or the temporary deposit of excavated earth. Remove all surplus material, tools and equipment.

B. Lawns: Topsoil with 4" of clean, friable, fertile topsoil conforming to D.O.T. Section 625, free from debris, lumps, rocks, roots, plants and seeds. Grade surfaces to match adjacent elevations. Rake smooth, free of lumps and debris. Sod with good quality nursery sod conforming to D.O.T. Section 631, be uniform, dense, free from weeds and consist of approximately 60% Kentucky blue grass and the balance perennial rye, fescue and white clover. Place sod with joints staggered and abutting. Maintain lawn areas for one month after installation. Contractor will be responsible for necessary watering and mowing. Do necessary weeding, repair, reseeding or resodding until uniform catch is obtained.

C. Curb and Gutter: Concrete curb and gutter conforming to city requirements and D.O.T. Section 601, Type D or L.

D. Sidewalk and Walkways: Non-reinforced concrete conforming to D.O.T. Section 602, thickness to match existing, cross slope of one-fourth inch per foot, scored into squares approximately equal to width.

E. Bituminous Concrete Pavements: 4" thick crushed stone base course conforming to D.O.T. Section 304 (excluding 304.2.4) and two pass bituminous concrete pavement conforming to D.O.T. Section 407, first course 1-1/2" binder, second course 1-1/2" surface.

3.7 CUTTING AND PATCHING

A. Refer to Division 01, General Requirements, Cutting and Patching.

3.8 BUILDING ACCESS

A. Arrange for the necessary openings in the building to allow for admittance or removal of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.9 EQUIPMENT ACCESS

A. Install all piping, conduit, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster walls or ceilings, furnish the access doors to the General Contractor.

3.10 COORDINATION

A. Coordinate all work with other contractors prior to installation. Any work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

B. Verify that all devices are compatible for the type of construction and surfaces on which they will be used.

3.11 IDENTIFICATION

A. Identify equipment in mechanical equipment rooms by equipment number and service with engraved name plates.

B. Identify interior piping not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where accessible piping passes through walls or floors. Place flow directional arrows at each pipe identification location.

C. Identify all exterior buried piping for entire length with underground warning tape except for sewer piping which is routed in straight lines between manholes or cleanouts. Place tape 6"-12" below finished grade along entire length of pipe. Extend tape to surface at building entrances, meters, hydrants and valves. Where existing underground warning tape is broken during excavation, replace with new tape identifying appropriate service and securely spliced to ends of existing tape.

D. Identify valves with brass tags bearing a system identification and a valve sequence number. Identify medical gas and vacuum valves with brass tags and wall or cabinet mounted color coded engraved nameplate with the following "(Type of Gas) Shutoff Valve for (Location or Zone)". Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device, located in another room or not visible from device. Provide a typewritten valve schedule and pipe identification schedule indicating the valve number and the equipment or areas supplied by each valve and the symbols used for pipe identification; locate schedules in mechanical room and in each Operating and Maintenance manual. Schedule in mechanical room to be framed under clear plastic.

3.12 LUBRICATION

A. Lubricate all bearings with lubricant as recommended by the manufacturer before the equipment is operated for any reason. Once the equipment has been run, maintain lubrication in accordance with the manufacturer's instructions until the work is accepted by the Owner. Maintain a log of all lubricants used and frequency of lubrication; include this information in the Operating and Maintenance Manuals at the completion of the project.

3.13 SLEEVES

A. Provide galvanized sheet metal sleeves for pipe penetrations through interior and exterior walls to provide a backing for sealant or firestopping. Patch wall around sleeve to match adjacent wall construction and finish. Grout area around sleeve in masonry construction. In finished spaces where pipe penetration through wall is exposed to view, sheet metal sleeve shall be installed flush with face of wall. In existing poured concrete walls where penetration is core drilled, pipe sleeve is not required.

B. Pipe sleeves are not required in interior non-rated drywall, plaster or wood partitions and sleeves are not required in existing poured concrete walls where penetrations are core drilled.

C. Pipe sleeves in new poured concrete construction shall be Schedule 40 steel pipe (sized to allow insulated pipe to run through sleeve), cast in place.

D. In all piping floor penetrations, fire rated and non-fire rated, top of sleeve shall extend 1" above the adjacent finished floor. In existing floor penetrations, core drill sleeve opening large enough to insert Schedule 40 sleeve and grout area around sleeve with hydraulic setting, non-shrink grout. If the pipe penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve that will transfer weight to existing floor structure.

E. For floor penetrations through existing floors in mechanical and wet locations listed below, core drill opening and provide 1-1/2" x 1-1/2" x 1/8" galvanized steel angles fastened to floor surrounding the penetration or group of penetrations to prevent water from entering the penetration. Provide urethane caulk between angles and floor and fasten angles to floor a minimum of 8" on center. Seal corners water tight with urethane caulk; or core drill sleeve openings large enough to insert Schedule 40 sleeve and grout area around sleeve with hydraulic setting non-shrink grout/cement.

F. Wet locations include:

1. Mechanical equipment rooms
2. Sanitary pumping stations
3. Chemical storage and hazardous waste storage rooms
4. Areas above kitchen or food preparation rooms

G. For pipe penetrations through existing floors in food service areas, core drill sleeve opening large enough to insert Schedule 40 sleeve and grout area around sleeve with hydraulic setting non-shrink grout/cement. Size sleeve to allow insulated pipe to pass through sleeve and paint the sleeve.

H. Pipe sleeves are not required in cored floor pipe penetrations through existing floors that are not located in mechanical rooms, food service areas or wet locations listed above.

I. At all piping floor penetrations, fire rated and non-fire rated, above kitchen or food prep areas, top of sleeve shall extend 1" above finished floor. Insert Schedule 40 sleeve and grout area watertight with hydraulic setting non-shrink grout.

3.14 SEALING AND FIRESTOPPING

A. Fire and/or Smoke Rated Penetrations

1. See Section 07 84 00 for firestopping.

B. Non-Rated Partitions

1. In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the pipe and tighten in place, in accordance with manufacturer's instructions.
2. At all interior partitions and exterior walls, pipe penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the pipe sleeve or cored opening and the pipe or insulation is completely blocked.

3.15 STORAGE AND HANDLING

A. Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.

B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Off-site storage agreements will not relieve the Contractor from using proper storage techniques.

D. Storage and protection methods must allow inspection to verify products.

3.16 PAINT

A. All interior non-prefinished equipment supports shall have prime coat of paint.

B. All new metal exposed to the atmosphere on the exterior of the building and which is not prefinished, shall be painted. Items such as supports and piping shall be painted as a minimum. Materials to be painted shall have prime coat along with two coats of P&L Effecto Enamel. Color shall be flat gray or match exterior. Verify with Owner.

C. All new metal, copper, or PVC vent(s), intake(s) or exhaust piping from sanitary waste/vent system, water heater(s), medical gas equipment that is exiting the vertical face of building is to be primed and painted to match exterior. Verify color with Owner. Turn piping down at 45 degrees and install bird screen over end.

END OF SECTION

SECTION 22 0518

ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the Plumbing drawings:

1) Escutcheons.
2) Floor plates.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 DEFINITIONS

A. Existing Piping to Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed and salvaged, or removed and reinstalled.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. BrassCraft Manufacturing Co.; a Masco company.
2. Dearborn Brass.
3. Jones Stephens Corp.
4. Keeney Manufacturing Company (The).
5. Mid-America Fittings, LLC; A Midland Industries Company.
6. ProFlo; a Ferguson Enterprises, Inc. brand.

2.2 ESCUTCHEONS

A. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Stainless-Steel Type: With polished stainless-steel finish.

C. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

D. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel or brass with polished, chrome-plated finish and spring-clip fasteners.

E. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

F. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed and exposed-rivet hinge; and spring-clip fasteners.

2.3 FLOOR PLATES

A. Split Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
b. Chrome-Plated Piping: One-piece steel, cast brass or split-casting brass with polished, chrome-plated finish.
c. Insulated Piping: One-piece steel with polished, chrome-plated finish.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece stainless steel with polished stainless-steel finish.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
g. Bare Piping in Unfinished Service Spaces: One-piece cast brass with rough-brass finish.
h. Bare Piping in Equipment Rooms: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor plate.

3.2 FIELD QUALITY CONTROL

A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION

SECTION 22 0519

METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the Plumbing drawings:

1) Bimetallic-actuated thermometers.
2) Liquid-in-glass thermometers.
3) Thermowells.
4) Pressure gages.
5) Gage attachments.
6) Test plugs.
7) Test-plug kits.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 22 1119 – Domestic Water Piping Specialties for water meters.
2. Section 22 6800 – Facility Natural Gas Piping for pipes, tubes and fittings, piping specialties, piping and tubing joining materials, valves and pressure regulators.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ashcroft Inc.
2. Palmer Wahl Instrumentation Group.
3. Tel-Tru Manufacturing Company.
4. Trerice, H. O. Co.
5. Watts Water Technologies; a Watts company.
6. Weiss Instruments, Inc.

B. Standard: ASME B40.200.

C. Case: Liquid-filled and sealed type(s); stainless steel with 5-inch nominal diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.

E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.

H. Window: Plain glass.

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus 1.5 percent of scale range.

2.2 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Trerice, H. O. Co.

2. Standard: ASME B40.200.
3. Case: Cast aluminum; 6-inch nominal size.
4. Case Form: Back angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass or plastic.

8. Stem: Aluminum or brass and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

9. Connector: 3/4 inch, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

2.4 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ametek U.S. Gauge.
    b. Ashcroft Inc.
    c. Palmer Wahl Instrumentation Group.
    d. Tel-Tru Manufacturing Company.
    e. Trerice, H. O. Co.
    f. Watts Water Technologies; a Watts company.
    g. Weiss Instruments, Inc.

2. Standard: ASME B40.100.
3. Case: Liquid-filled types; cast aluminum or drawn steel; 4-1/2-inch nominal diameter (gauges installed more than 10 feet above floor shall have 6” dial).
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Stainless steel.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

B. Direct-Mounted, Plastic-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Ametek U.S. Gauge.
   b. Ashcroft Inc.
   c. Palmer Wahl Instrumentation Group.
   d. Tel-Tru Manufacturing Company.
   e. Trerice, H. O. Co.
   f. Weiss Instruments, Inc.
   g. Weksler Glass Thermometer Corp.

2. Standard: ASME B40.100.
3. Case: Sealed type; plastic; 4-1/2-inch or (6-inch if installed more than 10 feet above floor) nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass or plastic.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass ball, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2.6 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Peterson Equipment Co., Inc.
2. Sico Incorporated.
3. Trerice, H. O. Co.
4. Watts Water Technologies; a Watts company.
5. Weiss Instruments, Inc.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

2.7 TEST-PLUG KITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Peterson Equipment Co., Inc.
2. Sico Incorporated.
3. Trerice, H. O. Co.
4. Watts Water Technologies; a Watts company.
5. Weiss Instruments, Inc.

B. Furnish one test-plug kit(s) containing one thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

C. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.

D. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range shall be at least 0 to 200 psig.

E. Carrying Case: Metal or plastic, with formed instrument padding.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Install valve and snubber in piping for each pressure gage for fluids.

J. Install test plugs in piping tees.

K. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlet and outlet of thermostatic mixing valve in domestic hot water return piping as indicated on drawings.

L. Install pressure gages in the following locations:

1. Inlet and outlet of each pressure-reducing valve.
2. Suction and discharge of each domestic water pump.
3. Inlet and outlet of RPZ's.
4. On natural gas lines before and after pressure regulators.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping:

1. 0 to 100 deg F.

B. Scale Range for Domestic Hot-Water Piping:

1. 30 to 240 deg F.

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping:

1. 0 to 100 psi.

B. Scale Range for Domestic Water Piping:

1. 0 to 100 psi.

END OF SECTION

SECTION 22 0523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the Plumbing drawings:

1) Bronze ball valves.
2) Iron, single-flange butterfly valves.
3) Bronze swing check valves.
4) Iron swing check valves.
5) Iron swing check valves with closure control.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 22 0553 – Identification for Plumbing Piping and Equipment for valve tags and schedules.
2. Section 22 1116 – Domestic Water Piping for valves applicable only to this piping.
3. Section 22 1319 – Sanitary Waste Piping Specialties for valves applicable only to this piping.
4. Section 22 1423 – Storm Drainage Piping Specialties for valves applicable only to this piping.
5. Section 22 6800 – Facility Natural Gas Piping for pipes, tubes and fittings, piping specialties, piping and tubing joining materials, valves and pressure regulators.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

B. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS FOR VALVES

A. Standards:

1. Domestic water valves intended to convey or dispense water for human consumption must comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or must be certified to be in compliance with NSF 61 and NSF 372 (by an ANSI-accredited third-party certification body) that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges on steel valves.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

5. ASME B16.18 for cast copper solder-joint connections.
6. ASME B16.22 for wrought copper and copper alloy solder-joint connections.
7. ASME B16.34 for flanged and threaded end connections
8. ASME B16.51 for press joint.

C. Provide bronze valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

D. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream piping unless otherwise indicated.

F. Valves in Insulated Piping:

1. Provide 2-inch extended neck stems.
2. Extended operating handles with nonthermal-conductive covering material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

G. Refer to valve schedule articles for applications of valves.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. A.Y. McDonald Manufacturing Co.
b. Conbraco Industries, Inc.; Apollo Valves.

c. Crane Co.; Crane Valve Group; Crane Valves.
d. Hammond Valve.
e. Jomar Valve.
f. Lance Valves; a division of Advanced Thermal Systems, Inc.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110; MSS SP-145
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded, soldered or press.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel.
j. Port: Full.

B. Three -Piece, Full-Port, Bronze Ball Valves with Stainless Steel Trim.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.

2. Description:

a. Standard: MSS SP-110; MSS SP-145.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Three piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Stainless Steel.
j. Port: Full.

2.3 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Hammond Valve.
d. Jomar Valve.

e. Milwaukee Valve Company.
f. NIBCO INC.
g. Watts.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

2.4 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Hammond Valve.
c. Jomar Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Powell Valves.
g. Red-White Valve Corporation.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 300 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded or soldered.
f. Disc: Bronze.

2.5 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Hammond Valve.
c. Jomar Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Powell Valves.
g. Red-White Valve Corporation.

h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged or threaded.
f. Trim: Bronze.
g. Gasket: Asbestos free.

2.6 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125, Iron Swing Check Valves with Lever- and Spring-Closure Control:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Valve.
b. Clow Valve Co.
c. DeZurik.
d. Kennedy Valve Co.

2. Description:

a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged or threaded.
f. Trim: Bronze.
g. Gasket: Asbestos free.
h. Closure Control: Factory-installed, exterior lever and spring.

B. Class 125, Iron Swing Check Valves with Lever- and Weight-Closure Control:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Valve.
b. Clow Valve Co.
c. DeZurik.
d. Kennedy Valve Co.
e. Milwaukee Valve Company.

2. Description:

a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged or threaded.
f. Trim: Bronze.
g. Gasket: Asbestos free.

h. Closure Control: Factory-installed, exterior lever and weight.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

3.2 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball or butterfly valves.
2. Throttling Service: Ball or butterfly valves.
3. Pump-Discharge Check Valves:

    a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.
    b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring.
    c. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
6. For Steel Piping, NPS 5 and Larger: Flanged ends.

3.4 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.

2. Bronze Angle Valves: Class 125, bronze disc.
3. Ball Valves: Two piece, full port.
4. Bronze Swing Check Valves: Class 150, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.

2. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.

3. Iron Swing Check Valves: Class 125, metal seats.
4. Iron Swing Check Valves with Closure Control: Class 125, lever and spring.

3.5 SANITARY-WASTE AND STORM-DRAINAGE VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.

2. Ball Valves: Two piece, full port.
3. Bronze Swing Check Valves: Class 125, nonmetallic disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Swing Check Valves: Class 125, metal seats.
2. Iron Swing Check Valves with Closure Control: Class 125, lever and spring or weight.

END OF SECTION

SECTION 22 0529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the Plumbing drawings:

1) Metal pipe hangers and supports.
2) Trapeze pipe hangers.
3) Thermal-hanger shield inserts.
4) Fastener systems.
5) Pipe stands.
6) Pipe positioning systems.
7) Equipment supports.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 RELATED WORK

A. Specified elsewhere:

1. Division 21 Fire Suppression Piping Sections for pipe hangers for fire-suppression piping.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports.

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating or epoxy power coated.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE STANDS

A. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

B. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.

2.6 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. See Division 22 plumbing fixture Sections for requirements for pipe positioning systems for plumbing fixtures.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with 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. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel o] corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS ½ to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS ½ to NPS 8.
5. U-Bolts (MSS Type 24): For support of heavy pipes NPS ½ to NPS 30.
6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 22 0548

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the Plumbing drawings:

1) Elastomeric isolation pads.
2) Elastomeric isolation mounts.
3) Restrained elastomeric isolation mounts.
4) Open-spring isolators.
5) Housed-spring isolators.
6) Restrained-spring isolators.
7) Housed-restrained-spring isolators.
8) Pipe-riser resilient support.
9) Resilient pipe guides.
10) Air-spring isolators.
11) Restrained-air-spring isolators.
12) Elastomeric hangers.
13) Spring hangers.
14) Snubbers.
15) Restraints - rigid type.
16) Restraints - cable type.
17) Restraint accessories.
18) Post-installed concrete anchors.
19) Concrete inserts.
20) Vibration isolation equipment bases.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 21 0548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" for devices for fire-suppression equipment and systems.

2. Section 23 0548 "Vibration and Seismic Controls for HVAC" for devices for HVAC equipment and systems.

1.3 DEFINITIONS

A. Designated Seismic System: A plumbing component that requires design in accordance with ASCE/SEI 7, Ch. 13 and for which the Component Importance Factor is greater than 1.0.

B. IBC: International Building Code.

C. OSHPD: Office of Statewide Health Planning and Development (for the State of California owned and regulated medical facilities).

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Include load rating for each wind-force-restraint fitting and assembly.
3. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component.
4. Annotate types and sizes of seismic restraints and accessories, complete with listing markings or report numbers and load rating in tension and compression as evaluated by ICC-ES product listing, UL product listing, OSHPD or an agency acceptable to authorities having jurisdiction.
5. Annotate to indicate application of each product submitted and compliance with requirements.
6. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal:

1. For each seismic-restraint device that is required by this Section, submit the following:

a. Seismic restraint, and vibration isolator, and isolation base selection: Select vibration isolators, seismic restraints, and vibration isolation bases complying with performance requirements, design criteria, and analysis data.
b. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification by professional engineer that riser system was examined for excessive stress and that none exists.
c. Concrete Anchors and Inserts: Include calculations showing anticipated seismic and wind loads. Include certification that device is approved by an NRTL for seismic reinforcement use.

d. Seismic Design Calculations: Submit all input data and loading calculations prepared in "Performance Requirements" Article in "Seismic Design Calculations" Paragraph.
e. Qualified Professional Engineer: All designated-design submittals for seismic calculations are to be signed and sealed by qualified professional engineer responsible for their preparation.

2. Seismic-Restraint Detail Drawing:

a. Design Analysis: To support selection and arrangement of seismic[**and wind**] restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.

3. Product Listing, Preapproval, and Evaluation Documentation: By UL, OSHPD or an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).
4. All delegated-design submittals for seismic- and wind-restraint detail Drawings are to be signed and sealed by qualified professional engineer responsible for their preparation.
5. Design Calculations for Vibration Isolation Devices: Calculate static and dynamic loading due to equipment weight and operating forces required to select proper vibration isolators, and to design vibration isolation bases.
6. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and spring deflection changes. Include certification that riser system was examined for excessive stress and that none exists.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer and testing agency.

B. Field quality-control reports:

C. Seismic Qualification Data: Provide special certification for designated seismic systems as indicated in [**ASCE/SEI 7-05,**] [**ASCE/SEI 7-10,**] [**ASCE/SEI 7-16,**] Paragraph 13.2.2, "Special Certification Requirements for Designated Seismic Systems" for all Designated Seismic Systems identified as such on Drawings or in the Specifications.

1. Provide equipment manufacturer's written certification for each designated active plumbing seismic device and system, stating that it will remain operable following the design earthquake.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For seismic restraints to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, be an NRTL as defined by OSHA in 29 CFR 1910.7, and be acceptable to authorities having jurisdiction.

B. Seismic-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: ICC-ES product listing, UL product listing or an agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic control system.

1. Seismic Performance: Equipment shall withstand the effects of earthquake motions determined in accordance with [**ASCE/SEI 7-05**] [**ASCE/SEI 7-10**] [**ASCE/SEI 7-16**].

B. Seismic Design Calculations:

1. Perform calculations to obtain force information necessary to properly select seismic-restraint devices, fasteners, and anchorage. Perform calculations using methods acceptable to applicable code authorities and as presented in [**ASCE/SEI 7-05**] [**ASCE/SEI 7-10 including supplement No. 1**] [**ASCE/SEI 7-16**]. Where "ASCE/SEI 7" is used throughout this Section, it is to be understood that the edition referred to in this subparagraph is the edition intended as reference throughout the section text.

a. Data indicated below to be determined by Delegated-Design Contractor must be obtained by Contractor and must be included in individual component submittal packages.
b. Building Occupancy Category: [**I**] [**II**] [**III**] [**IV**].
c. Building Risk Category: [**I**] [**II**] [**III**] [**IV**].
d. Building Site Classification: [**A**] [**B**] [**C**] [**D**] [**E**] [**F**].
e. Seismic Design Category: [**A**] [**B**] [**C**] [**D**] [**E**] [**F**].

C. Consequential Damage: Provide additional seismic and wind-force restraints for suspended plumbing components or anchorage of floor, roof or wall mounted plumbing components as indicated in [**ASCE/SEI 7-05**] [**ASCE/SEI 7-10**] [**ASCE/SEI 7-16**] so that failure of a non-essential or essential plumbing component will not cause the failure of any other essential architectural, mechanical or electrical building component.

D. Fire/Smoke Resistance: Seismic-restraint devices that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL in accordance with ASTM E84 or UL 723, and be so labeled.

E. Component Supports:

1. Load Ratings, features, and applications of all reinforcement components must be based on testing standards of a nationally recognized testing agency.

2. All component support attachments must comply with force and displacement resistance requirements of [**ASCE/SEI 7-05 Section 13.6**] [**ASCE/SEI 7-10 Section 13.6**] [**ASCE/SEI 7-16 Section 13.6**].

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties. Neoprene rubber, silicone rubber, or other elastomeric material.
5. Surface Pattern: Smooth, ribbed, or waffle pattern.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.

2. Mounting Plates:

   a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded.

3. Elastomeric Material: Molded, oil- and water-resistant neoprene rubber, silicone rubber, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.

2. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

a. Housing: Cast-ductile iron or welded steel.
b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
7. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.6 HOUSED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

   a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
   b. Top housing with attachment and leveling bolt, threaded mounting holes and internal leveling device or elastomeric pad.

2.7 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

    a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
    b. Top plate with threaded mounting holes or elastomeric pad.
    c. Internal leveling bolt that acts as blocking during installation.

3. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.8 HOUSED-RESTRAINED-SPRING ISOLATORS

A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with snubbers to limit vertical movement.

    a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
    b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.

3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.9 PIPE-RISER RESILIENT SUPPORT

A. All-Directional, Acoustical Pipe Anchor Consisting of Two Steel Tubes Separated by a Minimum 1/2-inch-Thick Neoprene:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
3. Maximum Load Per Support: 500 psig on isolation material providing equal isolation in all directions.

2.10 RESILIENT PIPE GUIDES

A. Telescopic Arrangement of Two Steel Tubes or Post and Sleeve Arrangement Separated by a Minimum 1/2-inch-Thick Neoprene:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.11 AIR-SPRING ISOLATORS

A. Freestanding, Single or Multiple, Compressed-Air Bellows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Bellows Assembly: Upper and lower powder-coated steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows or similar elastomeric material.
3. Maximum Natural Frequency: 3 Hz.
4. Operating Pressure Range: 25 to 100 psig.
5. Burst Pressure: At least three times manufacturer's published maximum operating pressure.
6. Automatic leveling valve.

2.12 RESTRAINED-AIR-SPRING ISOLATORS

A. Freestanding, Single or Multiple, Compressed-Air Bellows with Vertical-Limit Stop Restraint:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.

b. Mason Industries, Inc.

2. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

   a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
   b. Top plate with threaded mounting holes or elastomeric pad.
   c. Internal leveling bolt that acts as blocking during installation.

3. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Bellows Assembly: Upper and lower powder-coated steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows or similar elastomeric material.
8. Maximum Natural Frequency: 3 Hz.
9. Operating Pressure Range: 25 to 100 psig.
10. Burst Pressure: At least three times manufacturer's published maximum operating pressure.

2.13 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.

2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
3. Damping Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel-to-steel contact.

2.14 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.

2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.

2.15 SNUBBERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.

B. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Post-installed Concrete Anchor Bolts: Secure to concrete surface with post-installed concrete anchors. Anchors to be seismically prequalified in accordance with ACI 355.2 testing and designated in accordance with [**ACI 318-08 Appendix D for 2009 IBC**] [**ACI 318-11 Appendix D for 2012 IBC**] [**ACI 318-14 Ch. 17 for 2015 or 2018 IBC**]. Preset concrete inserts: Seismically prequalified in accordance with ICC-ES AC446 testing.
2. Anchors in Masonry: Design in accordance with TMS 402.
3. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
4. Resilient Cushion: Maximum 1/4-inch air gap, and minimum 1/4 inch thick.

2.16 RESTRAINTS - RIGID TYPE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.

B. Description: Shop- or field-fabricated bracing assembly made of ANSI/AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe as per NFPA 13, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.17 RESTRAINTS - CABLE TYPE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.

B. Seismic- and Wind-Load-Restraint Cables: ASTM A1023/A1023M galvanized or ASTM A603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets,

swivel, and bolts designed for seismic restraining cable service; with fittings attached by means of poured socket, swaged socket or mechanical (Flemish eye) loop.

C. Restraint cable assembly and cable fittings must comply with ASCE/SEI 19. All cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge type end fittings do not comply and are unacceptable.

2.18 RESTRAINT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.

B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Non-metallic stiffeners are unacceptable.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.19 POST-INSTALLED CONCRETE ANCHORS

A. Mechanical Anchor Bolts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kinetics Noise Control, Inc.
b. Mason Industries, Inc.

2. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.

B. Adhesive Anchor Bolts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kinetics Noise Control, Inc.
b. Mason Industries, Inc.

2. Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.

C. Provide post-installed concrete anchors that have been prequalified for use in seismic applications. Post-installed concrete anchors must comply with all requirements of [**ASCE/SEI 7-05, Ch. 13**] [**ASCE/SEI 7-10, Ch. 13**] [**ASCE/SEI 7-16, Ch. 13**].

1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.

2.20 CONCRETE INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.

B. Provide preset concrete inserts, which are seismically prequalified in accordance with ICC-ES AC466 testing.

C. Comply with ANSI/MSS 58.

2.21 VIBRATION ISOLATION EQUIPMENT BASES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.

B. Steel Rails: Factory-fabricated, welded, structural-steel rails.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide rails.
   a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A36/A36M. Rails shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

C. Steel Bases: Factory-fabricated, welded, structural-steel bases and rails.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.

a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A36/A36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

D. Concrete Inertia Base: Factory-fabricated or field-fabricated, welded, structural-steel bases and rails ready for placement of cast-in-place concrete.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.

a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A36/A36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by OSHPD or an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength is adequate to carry static and seismic load within specified loading limits.

3.3 INSTALLATION OF VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICES

A. Provide vibration-control devices for systems and equipment where indicated in Equipment Schedules or Vibration-Control Device Schedules, where indicated on Drawings, or where the Specifications indicate they are to be installed on specific equipment and systems.

B. Provide seismic-restraint devices for systems and equipment where indicated in Equipment Schedules or Seismic-Restraint Devices Schedules, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.

C. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

D. Installation of vibration isolators and seismic restraints must not cause any stresses, misalignment, or change of position of equipment or piping.

E. Equipment Restraints:

1. Install snubbers on plumbing equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
3. Install seismic-restraint devices using methods approved by OSHPD or an agency acceptable to authorities having jurisdiction that provides required submittals for component.

F. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

G. Install seismic-restraint cables so they do not bend across edges of adjacent equipment or building structure.

H. Install seismic-restraint devices using methods approved by OSHPD or an agency acceptable to authorities having jurisdiction that provides required submittals for component.

I. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

J. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

K. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

L. Post-Installed Concrete Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling.

Notify Project structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive-Type Anchor Bolts: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 INSTALLATION OF AIR-SPRING ISOLATORS

A. Independent Isolator Installation:

1. Install automatic leveling valve into each air isolator.
2. Inflate each isolator to height and pressure required by code.

3.5 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Provide flexible connections in piping systems where they cross structural seismic joints and other point where differential movement may occur. Provide adequate flexibility to accommodate differential movement as determined in accordance with ASCE/SEI 7. Comply with requirements in Section 221116 "Domestic Water Piping" and Section 221119 "Domestic Water Piping Specialties" for piping flexible connections.

3.6 INSTALLATION OF VIBRATION ISOLATION EQUIPMENT BASES

A. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate dimensions of steel equipment rails, bases, and concrete inertia bases, with requirements of isolated equipment specified in this and other Sections. Where dimensions of bases are indicated on Drawings, they may require adjustment to accommodate actual isolated equipment.

3.7 ADJUSTING

A. Adjust isolators after system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

3.8 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:
   1. Perform tests and inspections with the assistance of a factory-authorized service representative.
   2. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
   3. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
   4. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
   5. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
   6. Test to 90 percent of rated proof load of device.
   7. Measure isolator restraint clearance.
   8. Measure isolator deflection.
   9. Verify snubber minimum clearances.
   10. Test and adjust restrained-air-spring isolator controls and safeties.

C. Remove and replace malfunctioning units and retest as specified above.

D. Units will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION

SECTION 22 0553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the Plumbing drawings:

1) Equipment labels.
2) Warning signs and labels.
3) Pipe labels.
4) Valve tags.
5) Warning tags.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.3 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic labels for Equipment

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Brady Corporation.
    b. Carlton Industries, LP.
    c. Champion America.
    d. Craftmark Pipe Markers.
    e. LEM Products Inc.
    f. Marking Services Inc.
    g. Pipemarker.com; Brimar Industries, Inc.
    h. Seton Identification Products; a Brady Corporation company.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
3. Letter Color: Black.
4. Background Color: White.
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, ½ inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
8. Fasteners: Stainless-steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Carlton Industries, LP.
3. Champion America.
4. Craftmark Pipe Markers.
5. LEM Products Inc.
6. Marking Services Inc.
7. Pipemarker.com; Brimar Industries, Inc.

8. Seton Identification Products; a Brady Corporation company.

B. Letter Color: Red.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, ½ inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Carlton Industries, LP.
3. Champion America.
4. Craftmark Pipe Markers.
5. LEM Products Inc.
6. Marking Services Inc.
7. Pipemarker.com; Brimar Industries, Inc.
8. Seton Identification Products; a Brady Corporation company.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 VALVE TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Carlton Industries, LP.
3. Champion America.
4. Craftmark Pipe Markers.
5. LEM Products Inc.
6. Marking Services Inc.
7. Pipemarker.com; Brimar Industries, Inc.
8. Seton Identification Products; a Brady Corporation company.

B. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Carlton Industries, LP.
3. Champion America.
4. Craftmark Pipe Markers.
5. LEM Products Inc.
6. Marking Services Inc.
7. Pipemarker.com; Brimar Industries, Inc.
8. Seton Identification Products; a Brady Corporation company.

B. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Section 09 91 23 "Interior Painting."

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 20 feet along each run.

C. Pipe Label Color Schedule:

1. Domestic Water Piping:

    a. Background Color: Green.
    b. Letter Color: White.

2. Sanitary Waste and Storm Drainage Piping:

    a. Background Color: White
    b. Letter Color: Black

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

   a. Cold Water: 2 inches, round.
   b. Hot Water: 2 inches, round.

2. Valve-Tag Color:

   a. Cold Water: Natural.
   b. Hot Water: Natural.

3. Letter Color:

   a. Cold Water: Black.
   b. Hot Water: Black.

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 22 0719

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing and testing of the following material described within this specification as outlined on the Plumbing drawings:

1) Domestic cold-water piping.
2) Domestic hot-water piping.
3) Domestic recirculating hot-water piping.
4) Storm-water piping.
5) Roof drains and rainwater leaders.
6) Supplies and drains for handicap-accessible lavatories and sinks.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance, thickness and jackets (both factory and field-applied, if any).

1.3 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. 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.

D. 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.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Aeroflex USA, Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Johns Manville; Micro-Lok.
    b. Knauf Insulation; 1000-Degree Pipe Insulation.
    c. Manson Insulation Inc.; Alley-K.
    d. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-(SSL). Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

H. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Armacell LLC; Tubolit.
    b. Nomaco Insulation; IMCOLOCK and NOMALOCK.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Aeroflex USA, Inc.; Aeroseal.
    b. Armacell LLC; Armaflex 520 Adhesive.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
    d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies 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," including 2004 Addenda.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
    b. Eagle Bridges - Marathon Industries; 225.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
    d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies 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," including 2004 Addenda.

D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
    b. Eagle Bridges - Marathon Industries; 225.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
    d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive 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. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Dow Corning Corporation; 739, Dow Silicone.
    b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
    c. P.I.C. Plastics, Inc.; Welding Adhesive.
    d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive 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."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
    b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.
5. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Use sealants 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."

2.6 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Johns Manville; Zeston.
    b. P.I.C. Plastics, Inc.; FG Series.
    c. Proto Corporation; LoSmoke.
    d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.7 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Engineered Brass Company.
    b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
    c. McGuire Manufacturing.
    d. Plumberex.
    e. Truebro; a brand of IPS Corporation.
    f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

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 Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube 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 Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.

2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.9 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Domestic **Cold,** Hot and Recirculated Hot Water: Insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
3. Polyolefin: 1 inch thick.

B. Stormwater and Overflow: Insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
3. Polyolefin: 1 inch thick.

C. Roof Drain and Overflow Drain Bodies: Insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
3. Polyolefin: 1 inch thick.

D. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities: Protective shielding pipe covers.

3.13 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Piping, Exposed:

1. PVC: 20 mils thick.

END OF SECTION

SECTION 22 1116

DOMESTIC WATER PIPING

Lead-Free Statement: The wetted surfaces of plumbing fixtures described in this section have a weighted-average lead content of no more than 0.25% when used in applications intended to convey or dispense water for human consumption through drinking or cooking.

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing and testing of the following material described within this specification as outlined on the Plumbing drawings:

1) Domestic water pipes, tubes, fittings, and specialties inside the building.
2) Flexible connectors.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 SUBMITTALS

A. Product Data: For the following products:

1. Pipe and tube.
2. Fittings.
3. Joining materials.
4. Transition fittings.

B. Field quality-control reports.

1.3 PROJECT CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Architect, Construction Manager and Owner no fewer than two days in advance of proposed interruption of water service.
2. Do not proceed with interruption of water service without Architect's, Construction Manager's and Owner's written permission.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic, potable domestic water piping and components.

C. Comply with NSF 61 for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
5. Copper Pressure-Seal-Joint Fittings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Elkhart Products Corporation; Industrial Division.
        2) NIBCO INC.
        3) Viega; Plumbing and Heating Systems.

    b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
    c. NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber O-ring seal in each end.

B. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L water tube, annealed temper.

1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
2. Copper Pressure-Seal-Joint Fittings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Elkhart Products Corporation; Industrial Division.
        2) NIBCO INC.
        3) Viega; Plumbing and Heating Systems.

    b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
    c. NPS 3 and NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber O-ring seal in each end.

2.3 PEX TUBE AND FITTINGS

A. PEX Distribution System: ASTM F 877, SDR 9 tubing.

1. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper or stainless-steel crimp rings and matching PEX tube dimensions.
2. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 877; with plastic or corrosion-resistant-metal valve for each outlet.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.5 TRANSITION FITTINGS

A. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

B. Sleeve-Type Transition Coupling: AWWA C219.

2.6 FLEXIBLE CONNECTORS

A. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections NPS 2-1/2 and Larger: Flanged copper alloy.

B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

E. Install piping adjacent to equipment and specialties to allow service and maintenance.

F. Install piping to permit valve servicing.

G. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install PEX piping with loop at each change of direction of more than 90 degrees.

K. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

L. Install pressure gages on suction and discharge piping from each plumbing pump. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages.

M. Install thermostats in hot-water circulation piping. Comply with requirements in Division 22 Section "Domestic Water Pumps" for thermostats.

N. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.

O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Copper-Tubing, Push-on Joints: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.

H. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

I. PEX Piping Joints: Join according to ASTM F 1807.

J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping NPS 2 and smaller. Use butterfly or ball valves for piping NPS 2-1/2 and larger.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.6 FLEXIBLE CONNECTOR INSTALLATION

A. Install flexible connectors in suction and discharge piping connections to each domestic water pump.

B. Install bronze-hose flexible connectors in copper domestic water tubing.

C. Install stainless-steel-hose flexible connectors in steel domestic water piping.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

B. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

3. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Install supports for vertical steel piping every 15 feet.

H. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.

I. Install hangers for vertical PEX piping every 48 inches.

J. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.8 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to existing piping with shutoff valve; extend and connect to the following:

1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.
3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.9 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L; wrought- copper solder-joint fittings; and soldered joints.
2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
3. PEX Tube, NPS 1 and smaller; fittings for PEX tube; and crimped joints.

D. Aboveground domestic water piping, NPS 2-1/2 and Larger, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L; wrought- copper solder-joint fittings; and soldered joints.
2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.

3.13 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water Circulation Piping, Balancing Duty: Memory-stop balancing valves.

4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION

SECTION 22 1119

DOMESTIC WATER PIPING SPECIALTIES

Lead-Free Statement: The wetted surfaces of plumbing fixtures described in this section have a weighted-average lead content of no more than 0.25% when used in applications intended to convey or dispense water for human consumption through drinking or cooking.

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing and testing of the following material described within this specification as outlined on the Plumbing drawings:

1) Vacuum breakers.
2) Backflow preventers.
3) Balancing valves.
4) Temperature-actuated water mixing valves.
5) Strainers.
6) Hose bibbs.
7) Sill cocks.
8) Drain valves.
9) Water hammer arresters.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig , unless otherwise indicated.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.

2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ames Co.
    b. Cash Acme.
    c. Conbraco Industries, Inc.
    d. FEBCO; SPX Valves & Controls.
    e. Watts Industries, Inc.; Water Products Div.
    f. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Cash Acme.
    b. Conbraco Industries, Inc.
    c. Watts Industries, Inc.; Water Products Div.
    d. Woodford Manufacturing Company.
    e. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Rough bronze.

C. Pressure Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Conbraco Industries, Inc.
    b. FEBCO; SPX Valves & Controls.
    c. Watts Industries, Inc.; Water Products Div.
    d. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1020.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.

2.2 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Conbraco Industries, Inc.
    b. FEBCO; SPX Valves & Controls.
    c. Watts Industries, Inc.; Water Products Div.
    d. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1013 (UL listed or FM approved for fire service).
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
5. Accessories:

    a. Domestic Water Valves: Ball type with threaded ends on inlet and outlet ofNPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
    b. Fire Service Valves: UL listed OS&Y (resilient wedge) gate valves.
    c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Backflow-Preventer Test Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Conbraco Industries, Inc.
    b. FEBCO; SPX Valves & Controls.
    c. Watts Industries, Inc.; Water Products Div.
    d. Zurn Plumbing Products Group; Wilkins Div.

2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.3 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ITT Industries; Bell & Gossett Div.
    b. NIBCO INC.
    c. Taco, Inc.
    d. Watts Industries, Inc.: Water Products Div.

2. Type: Ball valve with two readout ports and memory setting indicator.
3. Body: Bronze.
4. Size: Same as connected piping, but not larger than NPS 2.

2.4 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Primary, Thermostatic, Water Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Lawler Manufacturing Company, Inc.
    b. Leonard Valve Company.
    c. Powers; a Watts Industries Co.
    d. Symmons Industries, Inc.

B. Individual-Fixture, Water Tempering Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Lawler Manufacturing Company, Inc.
    b. Leonard Valve Company.
    c. Powers; a Watts Industries Co.
    d. Watts Industries, Inc.; Water Products Div.
    e. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1016, thermostatically controlled water tempering valve.
3. Pressure Rating: 125 psig minimum, unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.
8. Tempered-Water Setting: 110 deg F.

2.5 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Drain: Factory-installed, hose-end drain valve.

2.6 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze.
9. Finish for Finished Rooms: Chrome or nickel plated.
10. Operation for Equipment Rooms: Wheel handle or operating key.
11. Operation for Finished Rooms: Operating key.
12. Include operating key with each operating-key hose bibb.
13. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.7 WALL HYDRANTS

A. Sill Cocks - Freezeless, Automatic Draining:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Smith, Jay. R. Mfg. Co.; Division of Smith Industries, Inc.
    b. Watts Industries, Inc.; Water Products Div.
    c. Woodford Manufacturing Company.
    d. Zurn Plumbing Products Group.

2. Standard: ASSE 1019, Type A or Type B.
3. Type: Freeze-resistant, automatic draining with integral vacuum breaker.
4. Classification: Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
5. Pressure Rating: 125 psig.
6. Operation: Loose key.
7. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
8. Inlet: NPS 3/4.
9. Outlet: Concealed, with integral vacuum breaker vacuum breaker complying with ASSE 1011; and garden-hose thread complying with ASME B1.20.7.
10. Box: Deep, flush mounting with cover.
11. Box and Cover Finish: Polished nickel bronze.
12. Outlet: Exposed, with integral vacuum breaker complying with ASSE 1011; and garden-hose thread complying with ASME B1.20.7.
13. Nozzle and Wall-Plate Finish: Polished nickel bronze.
14. Operating Keys(s): One with each wall hydrant.

2.8 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.9 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AMTROL, Inc.
    b. PPP Inc.
    c. Sioux Chief Manufacturing Company, Inc.
    d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    e. Tyler Pipe; Wade Div.
    f. Watts Drainage Products Inc.

g. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows or copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install balancing valves in locations where they can easily be adjusted.

D. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install thermometers and water regulators if specified.
2. Install cabinet-type units recessed in or surface mounted on wall as specified.

E. Install Y-pattern strainers for water on supply side of each control valve, solenoid valve and pump.

F. Install water hammer arresters in water piping according to PDI-WH 201.

G. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

H. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Intermediate atmospheric-vent backflow preventers.
2. Reduced-pressure-principle backflow preventers.
3. Primary, thermostatic, water mixing valves.

I. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3 ADJUSTING

A. Set field-adjustable flow of balancing valves.

B. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION

SECTION 22 1123

DOMESTIC WATER PUMPS

Lead-Free Statement: The wetted surfaces of plumbing fixtures described in this section have a weighted-average lead content of no more than 0.25% when used in applications intended to convey or dispense water for human consumption through drinking or cooking.

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the Plumbing drawings:

1) In-line, sealless centrifugal pumps.
2) Horizontally or vertically mounted, in-line, close-coupled centrifugal pumps.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

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.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

PART 2 - PRODUCTS

2.1 IN-LINE, SEALLESS CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong Pumps Inc.

2. Bell & Gossett Domestic Pump; ITT Corporation.
3. Grundfos Pumps Corp.
4. TACO Incorporated.

B. Description: Factory-assembled and -tested, in-line, close-coupled, canned-motor, sealless, overhung-impeller centrifugal pumps.

C. Pump Construction:

1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
2. Casing: Bronze, with threaded or companion-flange connections.
3. Impeller: Plastic.
4. Motor: Single speed, unless otherwise indicated.

D. Capacities and Characteristics:

1. See schedule on drawings.

2.2 IN-LINE, CLOSE-COUPLED CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong Pumps Inc.
2. Bell & Gossett Domestic Pump; ITT Corporation.
3. PACO Pumps; Grundfos Pumps Corporation, U.S.A.
4. Pentair Pump Group; Aurora Pump.
5. TACO Incorporated.

B. Description: Factory-assembled and -tested, in-line, single-stage, close-coupled, overhung-impeller centrifugal pumps designed for installation with pump and motor shaft mounted horizontal (vertical).

C. Pump Construction:

1. Casing: Radially split with threaded companion-flange connections for pumps with NPS 2 pipe connections and flanged connections for pumps with NPS 2-1/2 pipe connections.
2. Impeller: Statically, dynamically and hydraulically balanced, closed, and keyed to shaft.
3. Shaft and Shaft Sleeve: Steel shaft with deflector, with copper-alloy shaft sleeve. Include water slinger on shaft between motor and seal.
4. Seal: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket.
5. Bearings: Oil-lubricated; bronze-journal or ball type.
6. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.

D. Motor: Single speed, with grease-lubricated ball bearings; and resiliently or rigidly mounted to pump casing.

E. Capacities and Characteristics:

1. See schedule on drawings.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 22 05 13 "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.4 CONTROLS

A. Thermostats: Electric; adjustable for control of hot-water circulation pump.

1. Type: Water-immersion temperature sensor, for installation in piping.
2. Range: 50 to 125 deg F.
3. Enclosure: NEMA 250, Type 4X.
4. Operation of Pump: On or off.
5. Transformer: Provide if required.
6. Power Requirement: 24 V, ac.
7. Settings: Start pump at 105 deg F and stop pump at 115 deg F.

PART 3 - EXECUTION

3.1 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install in-line, sealless centrifugal pumps with shaft horizontal unless otherwise indicated.

C. Install horizontally mounted, in-line, close-coupled centrifugal pumps with shaft horizontal.

D. Install vertically mounted, in-line, close-coupled centrifugal pumps with shaft vertical.

E. Install continuous-thread hanger rods and spring hangers of size required to support pump weight.

1. Comply with requirements for vibration isolation devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment." Fabricate brackets or supports as required.
2. Comply with requirements for hangers and supports specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

F. Install thermostats in hot-water return piping.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 22 11 16 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps to allow service and maintenance.

C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.

1. Install flexible connectors adjacent to pumps in suction and discharge piping of the following pumps:

a. Horizontally mounted, in-line, close-coupled centrifugal pumps.
b. Vertically mounted, in-line, close-coupled centrifugal pumps.
c. Comply with requirements for flexible connectors specified in Section 22 11 16 "Domestic Water Piping."

2. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for valves specified in Section 22 05 23 "General-Duty Valves for Plumbing Piping" and comply with requirements for strainers specified in Section 22 11 19 "Domestic Water Piping Specialties."
3. Install pressure gage and snubber at suction of each pump and pressure gage and snubber at discharge of each pump. Install at integral pressure-gage tappings where provided or install pressure-gage connectors in suction and discharge piping around pumps. Comply with requirements for pressure gages and snubbers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

D. Connect thermostats to pumps that they control.

3.3 START-UP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Set thermostats for automatic starting and stopping operation of pumps.
5. Perform the following startup checks for each pump before starting:

    a. Verify bearing lubrication.
    b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
    c. Verify that pump is rotating in the correct direction.

6. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
7. Start motor.
8. Open discharge valve slowly.
9. Adjust temperature settings on thermostats.
10. Adjust timer settings.

3.4 ADJUSTING

A. Adjust domestic water pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature set points.

C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION

SECTION 22 1316

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the Plumbing drawings:

1) Pipe, tube, and fittings.
2) Specialty pipe fittings.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste and Vent Piping: 10-foot head of water.
2. Waste, Force-Main Piping: 50 psig.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of sanitary waste service.

2. Do not proceed with interruption of sanitary waste service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 and CISPI 301.

B. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ANACO-Husky.
   b. Fernco Inc.
   c. Tyler Pipe.

2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ANACO-Husky.
   b. Clamp-All Corp.
   c. Tyler Pipe.

2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. Adhesive Primer: ASTM F 656.

1. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Solvent Cement: ASTM D 2564.

1. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Unshielded, Nonpressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Fernco Inc.
2) Mission Rubber Company; a division of MCP Industries, Inc.
3) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

b. Standard: ASTM C 1173.
c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
d. Sleeve Materials:

1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Nonpressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cascade Waterworks Mfg. Co.
2) Mission Rubber Company; a division of MCP Industries, Inc.

b. Standard: ASTM C 1460.
c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 31 20 00 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping free of sags and bends.

F. Install fittings for changes in direction and branch connections.

G. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

H. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

I. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

J. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Horizontal Drainage Piping: 1/4 inch per foot downward in direction of flow for piping NPS 3 and smaller; 1/8 inch per foot downward in direction of flow for piping NPS 4 and larger.
2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

K. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

L. Install underground PVC piping according to ASTM D 2321.

M. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Comply with requirements for cleanouts specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

D. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Unshielded or Shielded, nonpressure transition couplings.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.

3. Vertical Piping: MSS Type 8 or Type 42, clamps.
4. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
6. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.

I. Install supports for vertical PVC piping every 48 inches.

J. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.

4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Comply with requirements for cleanouts and drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing

additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping shall be[**any of**] the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Aboveground, vent piping shall be[**any of**] the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

D. Underground, soil, waste, and vent piping shall be[**any of**] the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
3. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION

SECTION 22 1319

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the Plumbing drawings:

1) Cleanouts.
2) Floor drains.
3) Roof flashing assemblies.
4) Through-penetration firestop assemblies.
5) Miscellaneous sanitary drainage piping specialties.
6) Flashing materials.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 22 1423 - Storm Drainage Piping Specialties for roof drains and overflows.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

1. Cleanouts.
2. Floor drains.
3. Roof flashing assemblies.
4. Through-penetration firestop assemblies.
5. Miscellaneous sanitary drainage piping specialties.
6. Flashing materials.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    c. Tyler Pipe; Wade Div.
    d. Watts Drainage Products Inc.
    e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for adjustable housing or cast-iron soil pipe with cast-iron ferrule cleanout.
3. Size: Same as connected branch.
4. Body or Ferrule Material: Cast iron.
5. Closure: Gasketed brass plug.
6. Adjustable Housing Material: Cast iron with threads.
7. Frame and Cover Material and Finish: Scorated nickel-bronze, copper alloy.
8. Frame and Cover Shape:

    a. Round in concrete or carpeted floors.

        1) Floor cleanout installed under carpet shall come with optional carpet marker.

    b. Square in all floor types with square tile flooring.
    c. Cleanouts installed in terrazzo, linoleum, tile or composition floors shall come with recessed top for installation of said flooring material.

9. Top-Loading Classification: Light Duty, except areas which receive more than pedestrian traffic shall be heavy duty.
10. Verify all necessary options before ordering.

B. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div. Model 58640.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc. Model 4735.
    c. Tyler Pipe; Wade Div. Model W-84805.
    d. Watts Drainage Products Inc.
    e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.

4. Body: Hub-and-spigot, cast iron soil T-branch [**OR**] hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Wall Access: Square, nickel-bronze, flush to finish wall. Wall-installation frame and cover set flush to finish wall.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    c. Tyler Pipe; Wade Div.
    d. Watts Drainage Products Inc.
    e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing:

1. On shingled or tar and gravel roofs, flash pipes passing through the roof with four pound sheet lead. Flashing shall extend 12" from pipe underneath roofing material in all directions or provide a lead collar extending from flashing up around outside of, carried over and turned down into top of pipe.
2. On metal roof systems, Contractor shall use matching roof jacks.
3. Flash pipes passing through membrane roof with neoprene collar (Pate or equal) flashing with stainless steel band clamp specifically designed for membrane roofing. Flashing shall extend 12" from pipe underneath roofing material in all directions. Coordinate installation with Contractor.
4. Flash drains with flashing rings, unless otherwise specified, with four pound sheet lead extending 12" in all directions from flashing ring clamp device or of suitable approved material.

2.4 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. ProSet Systems Inc.

2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.

2.5 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft. thickness.
2. Vent Pipe Flashing: 8 oz./sq. ft. thickness.

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage
3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.

4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

G. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.

H. Assemble open drain fittings and install with top of hub 2 inches above floor.

I. Install deep-seal traps on floor drains.

J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

K. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

L. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 22 1413

FACILITY STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the Plumbing drawings:

1) Pipe, tube, and fittings.
2) Specialty pipe fittings.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 33 4100 - Storm Utility Drainage Piping for storm drainage piping outside the building.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure:

1. Storm Drainage Piping: 10-foot head of water.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ANACO-Husky.
    b. Fernco Inc.
    c. Mission Rubber Company; a division of MCP Industries, Inc.
    d. Tyler Pipe.

2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ANACO-Husky.
    b. Clamp-All Corp.
    c. Mission Rubber Company; a division of MCP Industries, Inc.
    d. Tyler Pipe.

2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. Adhesive Primer: ASTM F 656.

1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive primer 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."

D. Solvent Cement: ASTM D 2564.

1. PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Solvent cement 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."

2.5 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Unshielded, Nonpressure Transition Couplings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Fernco Inc.
        2) Mission Rubber Company; a division of MCP Industries, Inc.
        3) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

    b. Standard: ASTM C 1173.
    c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
    d. Sleeve Materials:

        1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
        2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
        3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Nonpressure Transition Couplings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Cascade Waterworks Mfg. Co.
        2) Mission Rubber Company; a division of MCP Industries, Inc.

    b. Standard: ASTM C 1460.
    c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 31 20 00 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations from layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping free of sags and bends.

F. Install fittings for changes in direction and branch connections.

G. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

H. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

I. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

J. Install storm drainage piping at the following minimum slopes unless otherwise indicated:

   1. Horizontal-Drainage Piping: 1/4 inch per foot downward in direction of flow for piping NPS 3 and smaller; 1/8 inch per foot downward in direction of flow for piping NPS 4 and larger.

K. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

L. Install aboveground PVC piping according to ASTM D 2665.

M. Install underground PVC piping according to ASTM D 2321.

N. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping. Comply with requirements for cleanouts specified in Section 22 14 23 "Storm Drainage Piping Specialties."
2. Install drains in storm drainage gravity-flow piping. Comply with requirements for drains specified in Section 22 14 23 "Storm Drainage Piping Specialties."

O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

D. Plastic, Nonpressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot pipe lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.

I. Install supports for vertical PVC piping every 48 inches.

J. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
2. Comply with requirements for cleanouts and drains specified in Section 22 14 23 "Storm Drainage Piping Specialties."

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.6 IDENTIFICATION

A. Identify exposed storm drainage piping. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PIPING SCHEDULE

A. Aboveground storm drainage piping shall be[**any of**] the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

B. Underground storm drainage piping shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy-duty, hubless-piping couplings; and coupled joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION

SECTION 22 1414

STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the plumbing drawings:

1) Hub-and-spigot, cast-iron soil pipe and fittings.
2) Hubless, cast-iron soil pipe and fittings.
3) Galvanized-steel pipe and fittings.
4) Copper tube and fittings.
5) ABS pipe and fittings.
6) PVC pipe and fittings.
7) Specialty pipe fittings.
8) Encasement for underground metal piping.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the plumbing drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 22 1429 – Sump Pumps for storm drainage pumps.
2. Section 33 4200 - Stormwater Conveyance for storm drainage piping outside the building.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. Galvanized-steel pipe and fittings.
4. Copper tube and fittings.
5. ABS pipe and fittings.
6. PVC pipe and fittings.

7. Specialty pipe fittings.

B. Shop Drawings: For controlled-flow roof drainage system. Include calculations, plans, sections, elevations, and details.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and elevations, or Building Information Model (BIM) drawn to scale, showing items described in this Section and coordinated with all building trades.

B. Seismic Qualification Certificates: For storm drainage piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of piping anchorage devices on which the certificate is based and their installation requirements.

C. Field Quality-Control Reports: Inspection reports signed by authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Provide materials bearing label, stamp, or other markings of specified testing agency.

1.6 FIELD CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of storm drainage service.
2. Do not proceed with interruption of storm drainage service without Construction Manager's written permission.

1.7 WARRANTY

A. Listed manufacturers to provide labeling and warranty of their respective products

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation are to be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: [**10-foot head of water**] <**Insert pressure**>.
2. Storm Drainage, Force-Main Piping: [**50 psig**] [**100 psig**] [**150 psig**] <**Insert pressure**>.

B. Seismic Performance: Storm drainage piping and support and installation to withstand the effects of earthquake motions determined in accordance with [**ASCE/SEI 7**] <**Insert requirement**>. See Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

1. 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 functional after the seismic event**]."
2. Component Importance Factor: [**1.5**] [**1.0**].
3. <**Insert requirements for Component Amplification Factor and Component Response Modification Factor**>

2.2 PIPING MATERIALS

A. Piping materials to bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AB & I Foundry; a part of the McWane family of companies.
2. Charlotte Pipe and Foundry Company.
3. Tyler Pipe; a part of McWane family of companies.

B. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standard: ASTM A74.
3. Class: [**Service weight**] [**and**] [**Extra heavy**] cast iron.

C. Gaskets: ASTM C564, rubber.

D. Caulking Materials: ASTM B29, pure lead and oakum or hemp fiber.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AB & I Foundry; a part of the McWane family of companies.
2. Charlotte Pipe and Foundry Company.
3. Tyler Pipe; a part of McWane family of companies.

B. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standards: ASTM A888 and CISPI 301.

C. Standard, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ANACO-Husky.
    b. Charlotte Pipe and Foundry Company.
    c. Dallas Specialty & Mfg. Co.
    d. Fernco Inc.
    e. Ideal Tridon Group.
    f. MIFAB, Inc.
    g. Matco-Norca.
    h. Mission Rubber Company, LLC; a division of MCP Industries.
    i. Tyler Pipe; a subsidiary of McWane Inc.
2. Marked with CISPI collective trademark [**and NSF certification mark**].
3. Standards: ASTM C1277 and CISPI 310.
4. Description: Stainless steel corrugated shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

D. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ANACO-Husky.
    b. Charlotte Pipe and Foundry Company.
    c. Dallas Specialty & Mfg. Co.
    d. Fernco Inc.
    e. Ideal Tridon Group.
    f. MIFAB, Inc.
    g. Matco-Norca.
    h. Mission Rubber Company, LLC; a division of MCP Industries.

2. Standard: ASTM C1277 or ASTM C1540.
3. Description: Stainless steel shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

E. Cast-Iron, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. MG Piping Products Company.

2. Standard: ASTM A1056.
3. Description: Two-piece ASTM A48/A48M, cast-iron housing; stainless steel bolts and nuts; and ASTM C564, rubber sleeve with integral, center pipe stop.

2.5 GALVANIZED-STEEL PIPE AND FITTINGS

A. Galvanized-Steel Pipe: ASTM A53/A53M, Type E, standard-weight class. Include ends matching joining method.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. U.S. Steel.
    b. Wheatland Tube; Zekelman Industries.

B. Cast-Iron Drainage Fittings: [**Galvanized,**]ASME B16.12, threaded.

C. Steel-Pipe Pressure Fittings:

1. Steel Pipe Nipples: [**Galvanized,**]ASTM A733, made of ASTM A53/A53M or ASTM A106/A106M, Schedule 40, seamless steel pipe. Include ends matching joining method.
2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
3. Gray-Iron, Threaded Fittings: [**Galvanized,**]ASME B16.4, Class 125, standard pattern.

D. Cast-Iron Flanges: ASME B16.1, Class 125.

1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

E. Grooved-Joint, Galvanized-Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International/Smith-Cooper International; Tailwind Capital, LLC.
    b. Shurjoint; a part of Aalberts Integrated piping Systems.
    c. Smith-Cooper International.

2. Galvanized, Grooved-End Fittings for Galvanized-Steel Piping:

    a. ASTM A536 ductile-iron castings.
    b. ASTM A234/A234M forged-steel fittings.

2.6 COPPER TUBE AND FITTINGS

A. Copper Tube:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Cambridge-Lee Industries, LLC.
    b. Cerro Flow Products, LLC.
    c. Wieland Copper Products, LLC.
2. Copper Type DWV Tube: ASTM B306, drainage tube, drawn temper.
3. Copper Tube, Drawn Temper: ASTM B88, Type L and Type M.
4. Copper Tube, Annealed Temper: ASTM B88, Type L.

B. Copper Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. NIBCO INC.
2. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
3. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
4. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
5. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.

    a. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
    b. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder: ASTM B32, lead free with ASTM B813, water-flushable flux.

2.7 ABS PIPE AND FITTINGS

A. ABS Pipe:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
    b. Charlotte Pipe and Foundry Company.
    c. JM Eagle.

2. NSF Marking: Comply with NSF 14 for plastic piping components. Include "NSF-dwv" marking for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.
3. Solid-Wall ABS Pipe: ASTM D2661, Schedule 40.
4. Cellular-Core ABS Pipe: ASTM F1488, Schedule 40.

B. ABS Socket Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Charlotte Pipe and Foundry Company.
    b. NIBCO INC.

2. Standard: ASTM D2661, made in accordance with ASTM D3311, drain, waste, and vent patterns.
3. NSF Marking: Comply with NSF 14 for plastic piping components. Include "NSF-dwv" marking for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.

C. Solvent Cement: ASTM D2235.

1. <Double click to insert sustainable design text for solvent cement.>

2.8 PVC PIPE AND FITTINGS

A. PVC Pipe:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Charlotte Pipe and Foundry Company.
    b. JM Eagle.
    c. National Pipe and Plastic, Inc.
    d. North America Pipe Corporation.
    e. Silver-line Plastics.
2. NSF Marking: Comply with NSF 14 for plastic piping components. Include marking with "NSF-dwv" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.
3. Solid-Wall PVC Pipe: ASTM D2665 drain, waste, and vent.
4. Cellular-Core PVC Pipe: ASTM F891, Schedule 40.

B. PVC Socket Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Charlotte Pipe and Foundry Company.
    b. NIBCO INC.
    c. North America Pipe Corporation.

2. Standard: ASTM D2665, made in accordance with ASTM D3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
3. NSF Marking: Comply with NSF 14 for plastic piping components. Include marking with "NSF-dwv" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.

C. Adhesive Primer: ASTM F656.

1. <Double click to insert sustainable design text for adhesive primer.>
2. <Double click to insert sustainable design text for adhesive primer.>

D. Solvent Cement: ASTM D2564.

1. <Double click to insert sustainable design text for solvent cement.>

2.9 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections of same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Unshielded, Nonpressure Transition Couplings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Dallas Specialty & Mfg. Co.
2) Fernco Inc.
3) Mission Rubber Company, LLC; a division of MCP Industries.

b. Standard: ASTM C1173.
c. Description: Elastomeric sleeve, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
d. Sleeve Materials:

1) For Cast-Iron Soil Pipes: ASTM C564 rubber.
2) For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926 PVC.
3) For Dissimilar Pipes: ASTM D5926 PVC or other material compatible with pipe materials being joined.

4. Shielded, Nonpressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Dallas Specialty & Mfg. Co.
2) Fernco Inc.
3) Mission Rubber Company, LLC; a division of MCP Industries.

b. Standard: ASTM C1460.
c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
d. End Connections: Same size as and compatible with pipes to be joined.

5. Pressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cascade Waterworks Mfg. Co.
2) EBAA Iron Sales, Inc.
3) Ford Meter Box Company, Inc. (The).
4) JCM Industries, Inc.
5) Romac Industries, Inc.

b. Standard: AWWA C219.
c. Description: Metal, sleeve-type couplings same size as pipes to be joined, and with pressure rating at least equal to and ends compatible with pipes to be joined.
d. Center-Sleeve Material: [**Manufacturer's standard**] [**Carbon steel**] [**Stainless steel**] [**Ductile iron**] [**Malleable iron**].
e. Gasket Material: Natural or synthetic rubber.
f. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) A.Y. McDonald Mfg. Co.
2) HART Industrial Unions, LLC.
3) Jomar Valve.
4) Matco-Norca.
5) WATTS; A Watts Water Technologies Company.
6) Zurn Industries, LLC.

b. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: [**150 psig minimum at 180 deg F**] [**150 psig**] [**250 psig**] <**Insert pressure**>.
3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

a. Manufacturers: Subject to compliance with requirements, provide products by the following:

1) WATTS; A Watts Water Technologies Company.

b. Description:

1) Standard: ASSE 1079.
2) Factory-fabricated, bolted, companion-flange assembly.
3) Pressure Rating: [**150 psig minimum at 180 deg F**] [**175 psig**] [**300 psig**] <**Insert pressure and temperature**>.
4) End Connections: Solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Advance Products & Systems, LLC.
2) GPT; an EnPro Industries company.

b. Description:

1) Nonconducting materials for field assembly of companion flanges.
2) Pressure Rating: [**150 psig**] <**Insert pressure**>.
3) Gasket: Neoprene or phenolic.
4) Bolt Sleeves: Phenolic or polyethylene.
5) Washers: Phenolic with steel-backing washers.

5. Dielectric Nipples:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Anvil International/Smith-Cooper International; Tailwind Capital, LLC.
2) Matco-Norca.

3) Precision Plumbing Products.

b. Description: Electroplated steel nipple.
c. Standards: ASTM F492, ASME B1.20.1.
d. Pressure Rating: [**300 psig at 225 deg F**] <**Insert pressure and temperature**>.
e. End Connections: Male threaded or grooved.
f. Lining: Inert and noncorrosive, propylene.

2.10 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A674 or AWWA C105/A 21.5.

B. Material: [**High-density, crosslaminated polyethylene film of 0.004-inch**] [**or**] [**linear low-density polyethylene film of 0.008-inch**] minimum thickness.

C. Form: [**Sheet**] [**or**] [**tube**].

D. Color: [**Black**] [**or**] [**natural**] <**Insert color**>.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

B. Install piping as indicated unless deviations from layout are approved on coordination drawings.

C. Install piping in concealed locations.

1. Piping installed in equipment rooms, service areas, and where indicated may be exposed.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

L. Make changes in direction for piping using appropriate branches, bends, and long-sweep bends.

1. Do not change direction of flow more than 90 degrees.
2. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

    a. Reducing size of drainage piping in direction of flow is prohibited.

M. Lay buried building piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

N. Install piping at the following minimum slopes unless otherwise indicated.

1. Building Storm Drain: [**1/4 inch per foot**] <**Insert number**> downward in direction of flow for piping NPS 3 and smaller; [**1/8 inch per foot**] [**1/4 inch per foot**] <**Insert number**> downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Storm Drainage Piping: [**1/4 inch per foot**] <**Insert number**> downward in direction of flow.

O. Install cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Ch IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping in accordance with ASTM A674 or AWWA C105/A 21.5.

P. Install steel piping in accordance with applicable plumbing code.

Q. Install aboveground copper tubing in accordance with CDA's "Copper Tube Handbook."

R. Install aboveground ABS piping in accordance with ASTM D2661.

S. Install aboveground PVC piping in accordance with ASTM D2665.

T. Install underground [**ABS**] [**and**] [**PVC**] piping in accordance with ASTM D2321.

U. Install engineered controlled-flow drain specialties and storm drainage piping in locations indicated.

1. Install encasement on piping in accordance with ASTM A674 or AWWA C105/A 21.5.

V. Install force mains at elevations indicated.

W. Plumbing Specialties:

1. Install backwater valves in storm drainage gravity-flow piping.

    a. Comply with requirements for backwater valves specified in Section 221423 "Storm Drainage Piping Specialties."

2. Install cleanouts in storm drainage gravity-flow piping in accessible locations.

    a. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
    b. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."

3. Install drains in storm drainage gravity-flow piping.

    a. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."

X. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Y. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

Z. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

AA. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hub-and-Spigot, Cast-Iron Soil Piping Caulked Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum caulked joints.

C. Hubless, Cast-Iron Soil Piping Coupled Joints: Join in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1.

1. Cut threads full and clean using sharp dies.
2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

    a. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.

b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
c. Do not use pipe sections that have cracked or open welds.

E. Join copper tube and fittings with soldered joints in accordance with ASTM B828. Use ASTM B813, water-flushable, lead-free flux and ASTM B32, lead-free-alloy solder.

F. Grooved Joints: Cut groove ends of pipe in accordance with AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fittings. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

G. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

H. Plastic, Nonpressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join in accordance with ASTM D2235 and ASTM D2661 appendices.
3. PVC Piping: Join in accordance with ASTM D2855 and ASTM D2665 appendices.

I. Joint Restraints and Sway Bracing:

1. Provide joint restraints and sway bracing for storm drainage piping joints to comply with the following conditions:

a. Provide axial restraint for pipe and fittings [**5 inches**] <**Insert dimensions**> and larger, upstream and downstream of all changes in direction, branches, and changes in diameter greater than two pipe sizes.
b. Provide rigid sway bracing for pipe and fittings [**4 inches**] <**Insert dimensions**> and larger, upstream and downstream of all changes in direction 45 degrees and greater.
c. Provide rigid sway bracing for pipe and fittings [**5 inches**] <**Insert dimensions**> and larger, upstream and downstream of all changes in direction and branch openings.

3.4 INSTALLATION OF SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Drainage Piping: [**Unshielded**] [**Shielded**], nonpressure transition couplings.
3. In Aboveground Force-Main Piping: Fitting-type transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for [**NPS 2**] <**Insert pipe size**> and Smaller: Use dielectric [**nipples**] [**unions**].
3. Dielectric Fittings for [**NPS 2-1/2 to NPS 4**] <**Insert pipe size range**>: Use dielectric [**flanges**] [**flange kits**] [**nipples**].
4. Dielectric Fittings for [**NPS 5**] <**Insert pipe size**> and Larger: Use dielectric flange kits.

3.5 INSTALLATION OF VALVES

A. General valve installation requirements for general-duty valve installations are specified in the following Sections:

1. Section 220523.12 "Ball Valves for Plumbing Piping."
2. Section 220523.13 "Butterfly Valves for Plumbing Piping."
3. Section 220523.14 "Check Valves for Plumbing Piping."
4. Section 220523.15 "Gate Valves for Plumbing Piping."

B. Shutoff Valves:

1. Install shutoff valve on each sump pump discharge.
2. Install [**gate**] [**full port ball valve**] for piping NS 2 and smaller.
3. Install [**gate**] [**butterfly**] <**Insert type**> valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing-check valve, between pump and shutoff valve, on each sump pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves.[**Use normally closed type unless otherwise indicated.**]
2. Install backwater valves in accessible locations.
3. Comply with requirements for backwater valves specified in Section 221423 "Storm Drainage Piping Specialties."

3.6 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for hangers, supports, and anchor devices specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install [**carbon-steel**] <**Insert material**> pipe hangers for horizontal piping in noncorrosive environments.
2. Install [**stainless steel**] [**fiberglass**] pipe hangers for horizontal piping in corrosive environments.
3. Install [**carbon-steel**] <**Insert material**> pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install hangers for [**cast-iron**] [**galvanized-steel**] [**and**] [**copper**] soil [**tubing**] [**and**] [**piping**], with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Install hangers for [**ABS**] [**and**] [**PVC**] piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

E. Support horizontal piping and tubing within 12 inches of each fitting[**, valve,**] and coupling.

F. Support vertical [**cast-iron**] [**galvanized steel**] [**and**] [**copper**] [**tubing**] [**and**] [**piping**] to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent, but as a minimum at base and at each floor.

G. Support vertical [**ABS**] [**and**] [**PVC**] piping with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
2. Install horizontal backwater valves [**with cleanout cover flush with floor**] [**in pit with pit cover flush with floor**] <**Insert description**>.
3. Comply with requirements for [**backwater valves**] [**cleanouts**] [**and**] [**drains**] specified in Section 221423 "Storm Drainage Piping Specialties."

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections in accordance with the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed storm drainage piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping in accordance with procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

    a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

3. Test Procedure:

    a. Test storm drainage piping[**, except outside leaders,**] on completion of roughing-in.
    b. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
    c. From 15 minutes before inspection starts until completion of inspection, water level must not drop.
    d. Inspect joints for leaks.

4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials.

a. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

3.10 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

3.11 PROTECTION

A. Protect piping and drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day and when work stops.

C. Repair damage to adjacent materials caused by storm drainage piping installation.

3.12 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground storm drainage piping [**NPS 6 and smaller**] <**Insert pipe size range**> is to be[**any of**] the following:

1. Service weight, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; [**CISPI,**] [**heavy-duty,**] hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Copper Type DWV tube, copper drainage fittings, and soldered joints.
5. [**Solid-wall**] [**Cellular-core**] ABS pipe, ABS socket fittings, and solvent-cemented joints.
6. [**Solid-wall**] [**Cellular-core**] PVC pipe, PVC socket fittings, and solvent-cemented joints.
7. Dissimilar Pipe-Material Couplings: [**Unshielded**] [**Shielded**], nonpressure transition couplings.

C. Aboveground, storm drainage piping [**NPS 8 and larger**] <**Insert pipe size range**> is to be[**any of**] the following:

1. Service weight, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; [**CISPI,**] [**heavy-duty,**] hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Copper Type DWV tube, copper drainage fittings, and soldered joints.
5. [**Solid-wall**] [**Cellular-core**] PVC pipe, PVC socket fittings, and solvent-cemented joints.
6. Dissimilar Pipe-Material Couplings: [**Unshielded**] [**Shielded**], nonpressure transition couplings.

D. Underground storm drainage piping [**NPS 6 and smaller**] <**Insert pipe size range**> shall be[**any of**] the following:

1. [**Extra heavy**] [**Service weight**], cast-iron soil pipe and fittings; [**gaskets; and gasketed**] [**caulking materials; and caulked**] joints.
2. Hubless, cast-iron soil pipe and fittings; [**CISPI,**] [**heavy-duty,**] [**cast-iron,**] hubless-piping couplings; and coupled joints.
3. [**Solid-wall**] [**Cellular-core**] ABS pipe, ABS socket fittings, and solvent-cemented joints.
4. [**Solid-wall**] [**Cellular-core**] PVC pipe, PVC socket fittings, and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: [**Unshielded**] [**Shielded**], nonpressure transition couplings.

E. Underground, storm drainage piping [**NPS 8 and larger**] <**Insert pipe size range**> is to be[**any of**] the following:

1. [**Extra heavy**] [**Service weight**], cast-iron soil pipe and fittings; [**gaskets; and gasketed**] [**caulking materials; and caulked**] joints.
2. Hubless, cast-iron soil pipe and fittings; [**CISPI,**] [**heavy-duty,**] [**cast-iron,**] hubless-piping couplings; and coupled joints.
3. [**Solid-wall**] [**Cellular-core**] PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Cellular-core, sewer and drain series, PVC pipe; PVC socket fittings; and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: [**Unshielded**] [**Shielded**], nonpressure transition couplings.

F. Aboveground storm drainage force mains [**NPS 1-1/2 and NPS 2**] <**Insert pipe size range**> is to be[**any of**] the following:

1. Hard copper tube, Type L copper pressure fittings, and soldered joints.
2. Galvanized-steel pipe, pressure fittings, and threaded joints.

G. Aboveground storm drainage force mains [**NPS 2-1/2 to NPS 6**] <**Insert pipe size range**> is to be[**any of**] the following:

1. Hard copper tube, Type L copper pressure fittings, and soldered joints.
2. Galvanized-steel pipe, pressure fittings, and threaded joints.
3. Grooved-end, galvanized-steel pipe; grooved-joint, galvanized-steel-pipe appurtenances; and grooved joints.
4. Fitting-type transition couplings if dissimilar pipe materials.

END OF SECTION

SECTION 22 1423

STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the plumbing drawings:

1) Roof drains.
2) Miscellaneous storm drainage piping specialties.
3) Cleanouts.
4) Flashing materials.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the plumbing drawings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 ROOF DRAINS

A. Cast-Iron, General-Purpose Roof Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company.
b. Smith, Jay R. Mfg. Co.
c. Tyler Pipe / Wade Division.
d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.4, for general-purpose roof drains.

3. Body Material: Cast iron.
4. Dimension of Body: Nominal 11 - 14 inch diameter.
5. Combination Flashing Ring and Gravel Stop: Required.
6. Flow-Control Weirs: Not required.
7. Outlet: Bottom.
8. Extension Collars: As Required.
9. Underdeck Clamp: Required.
10. Dome Material: Aluminum.

2.2 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

A. Conductor Nozzles:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company.
    b. Smith, Jay R. Mfg. Co.
    c. Tyler Pipe / Wade Division.
    d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Description: Bronze body with threaded inlet and bronze wall flange with mounting holes.
3. Size: Same as connected conductor.
4. Nozzles shall have a removable screen mesh to prevent vandalism from the outside.

2.3 CLEANOUTS

A. Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company.
    b. Smith, Jay R. Mfg. Co.
    c. Tyler Pipe / Wade Division.
    d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M, for cast-iron soil pipe with flanged ferrule and threaded, adjustable housing cleanouts.
3. Size: Same as connected branch.
4. Body or Ferrule Material: Cast iron.
5. Closure: Gasketed brass plug.
6. Adjustable Housing Material: Cast iron with threads.
7. Frame and Cover Material and Finish: Scorated nickel-bronze, copper alloy.
8. Frame and Cover Shape:

    a. Round in concrete or carpeted floors.

        1) Floor cleanout installed under carpet shall come with optional carpet marker.

    b. Square in all floor types with square tile flooring.
    c. Cleanouts installed in terrazzo, linoleum, tile or composition floors shall come with recessed top for installation of said flooring material.

9. Top-Loading Classification: Light Duty, except areas which receive more than pedestrian traffic shall be heavy duty.
10. Verify all necessary options before ordering.

B. Test Tees:

1. Standard: ASME A112.36.2M and ASTM A 74, ASTM A 888, or CISPI 301, for cleanout test tees.
2. Size: Same as connected drainage piping.
3. Body Material: Hub-and-spigot, cast-iron soil-pipe T-branch or hubless, cast-iron soil-pipe test tee as required to match connected piping.
4. Closure Plug: raised head, brass.
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

C. Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company.
   b. Smith, Jay R. Mfg. Co.
   c. Tyler Pipe / Wade Division.
   d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M, for cleanouts. Include wall access.
3. Size: Same as connected drainage piping.
4. Body Material: Hub-and-spigot, cast-iron soil-pipe T-branch or Hubless, cast-iron soil-pipe test tee as required to match connected piping.
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
6. Wall Access: Square, nickel-bronze wall-installation frame and cover set flush to finish wall.

2.4 FLASHING MATERIALS

A. Copper Sheet: ASTM B 152/B 152M, 12 oz./sq. ft..

B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

D. Fasteners: Metal compatible with material and substrate being fastened.

E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: ASTM B 32, lead-free alloy.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Install expansion joints, if indicated, in roof drain outlets.

3. Position roof drains for easy access and maintenance.

B. Install downspout adapters on outlet of back-outlet parapet roof drains and connect to sheet metal downspouts.

C. Install downspout boots at grade with top 18 inches above grade. Secure to building wall.

D. Install conductor nozzles at exposed bottom of conductors where they spill onto grade.

E. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
3. Locate cleanouts at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate cleanouts at base of each vertical soil and waste stack.

F. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

G. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

H. Install test tees in vertical conductors and near floor.

I. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

J. Install sleeve flashing device with each conductor passing through floors with waterproof membrane.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 22 14 13 “Facility Storm Drainage Piping”. Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of 6.0-lb/sq. ft. lead sheets, 0.0938-inch thickness or thicker. Solder joints of 4.0-lb/sq. ft. lead sheets, 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching the pipe size, with a minimum length of 10 inches and with skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 22 3400

FUEL-FIRED, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the plumbing drawings:

1) Commercial, gas-fired, high efficiency, storage, domestic-water heaters.
2) Domestic-water heater accessories.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics and furnished specialties and accessories.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

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.

B. ASHRAE/IESNA 90.1 Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.

C. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61, "Drinking Water System Components - Health Effects."

1.5 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.6 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 COMMERCIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS

A. Commercial, Gas-Fired, High-Efficiency, Storage, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. PVI Industries, LLC.
    b. Rheem Manufacturing Company.
    c. Bradford-White.
    d. State Industries.

2. Standard: ANSI Z21.10.3/CSA 4.3.
3. Description: Manufacturer's proprietary design to provide at least 95 percent combustion efficiency at optimum operating conditions.
4. Storage-Tank Construction: ASME-code steel with 150-psig minimum working-pressure rating.

    a. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

        1) NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.
        2) NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

    b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

5. Factory-Installed Storage-Tank Appurtenances:

    a. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
    b. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
    c. Jacket: Steel with enameled finish.
    d. Burner: High efficiency pre-mix powered burner.
    e. Control: Electronic operating thermostat with LED temperature readout.
    f. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
    g. Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4-M. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

6. Direct Vent: (3") 4" diameter PVC pipe.
7. Sealed Combustion: 4" diameter PVC pipe.

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AMTROL Inc.
   b. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
   c. State Industries.
   d. Wilkins.

2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:

   a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
   b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
   c. Air-Charging Valve: Factory installed.

B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.

D. Heat-Trap Fittings: ASHRAE 90.2.

E. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.

F. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.

G. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

   1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

H. Pressure Relief Valves: Include pressure setting less than domestic-water heater working-pressure rating.

   1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

I. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4-M.

J. Where water heater is located at an elevation above the fixture outlets or is bottom fed, provide and install a vacuum relief valve.

   1. Wilkins VR10
   2. Watts N36
   3. Conbraco 37-100

4. Cash-Acme VR-81

K. Condensate Neutralization Kit - Size neutralization kit according to water heater BTU capacity.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in [**Section 03 30 00 "Cast-in-Place Concrete."**] [**Section 03 30 53 "Miscellaneous Cast-in-Place Concrete."**]

1. Exception: Omit concrete bases for commercial domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
2. Maintain manufacturer's recommended clearances.
3. Arrange units so controls and devices that require servicing are accessible.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Install anchor bolts to elevations required for proper attachment to supported equipment.
8. Anchor domestic-water heaters to substrate.

B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 22 05 23 "General-Duty Valves for Plumbing Piping."

C. Install gas-fired, domestic-water heaters according to NFPA 54.

1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 23 11 23 "Facility Natural-Gas Piping."

D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

E. Install [**combination temperature-and-**]pressure relief valves in water piping for domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters

that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 22 11 19 "Domestic Water Piping Specialties."

G. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

H. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.

I. Fill domestic-water heaters with water.

J. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for domestic-water piping specified in Section 22 11 16 "Domestic Water Piping."

B. Comply with requirements for gas piping specified in Section 23 11 23 "Facility Natural-Gas Piping."

C. Drawings indicate general arrangement of piping, fittings, and specialties.

D. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 01 40 00 "Quality Requirements" for retesting and reinspecting requirements and Section 01 73 00 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain commercial, gas-fired, storage, domestic-water heaters.

END OF SECTION

SECTION 22 4000

PLUMBING FIXTURES

Lead-Free Statement: The wetted surfaces of plumbing fixtures described in this section have a weighted-average lead content of no more than 0.25% when used in applications intended to convey or dispense water for human consumption through drinking or cooking.

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the plumbing drawings:

1) Faucets.
2) Flushometers.
3) Toilet seats.
4) Protective shielding guards.
5) Fixture supports.
6) Water closets.
7) Lavatories.
8) Stainless steel sinks.
9) Service sinks.
10) Electric water coolers.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 10 - Toilet, Bath and Laundry Accessories.
2. Section 22 1119 - Domestic Water Piping Specialties for vacuum breakers, backflow preventers, balancing valves, temperature-actuated water mixing valves, strainers, hose bibbs, sill cocks, drain valves, water hammer arresters.
3. Section 22 4600 - Security Plumbing Fixtures for Stainless steel combination units, stainless steel showers, flushometer valves, supports.

1.3 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated, include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment and supports. Indicate materials and finishes, dimensions, construction details and flow-control rates.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; Public Law 101-336, "Americans with Disabilities Act" [**and Illinois Accessibility Code**]; for plumbing fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

F. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.

G. ASHRAE Standard: Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants" for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant unless otherwise indicated.

H. Comply with the following applicable standards and other requirements specified for faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
3. Faucets: ASME A112.18.1.
4. Hose-Connection Vacuum Breakers: ASSE 1011.
5. Hose-Coupling Threads: ASME B1.20.7.
6. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
7. NSF Potable-Water Materials: NSF 61.
8. Pipe Threads: ASME B1.20.1.
9. Supply Fittings: ASME A112.18.1.
10. Brass Waste Fittings: ASME A112.18.2.

I. Comply with the following applicable standards and other requirements specified for bathtub/shower faucets:

1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
3. Faucets: ASME A112.18.1.
4. Hand-Held Showers: ASSE 1014.
5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Manual-Control Antiscald Faucets: ASTM F 444.
8. Pipe Threads: ASME B1.20.1.
9. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
10. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

J. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.
3. Manual-Operation Flushometers: ASSE 1037.

4. Plastic Tubular Fittings: ASTM F 409.
5. Brass Waste Fittings: ASME A112.18.2.

PART 2 - PRODUCTS

2.1 FAUCETS

A. Lavatory / Sink Faucets,:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bradley Corporation.
    b. Chicago Faucets.
    c. Elkay Manufacturing Co.
    d. Kohler Co.
    e. Sloan.
    f. Speakman Company.
    g. Zurn Plumbing Products Group; Commercial Brass Operation.

2. Description: Refer to plumbing fixture schedule on drawings.

2.2 FLUSHOMETERS

A. Flushometers,:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Coyne & Delany Co.
    b. Delta Faucet Company.
    c. Sloan Valve Company.
    d. Zurn Plumbing Products Group; Commercial Brass Operation.

2. Description: Refer to Plumbing Fixture Schedule on drawings. Include brass body with corrosion-resistant internal components, control stop with check valve, vacuum breaker, copper or brass tubing and polished chrome-plated finish on exposed parts.

2.3 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bemis Manufacturing Company.
    b. Church Seats.
    c. Olsonite Corp.
    d. Sanderson Plumbing Products, Inc.; Beneke Div.

2. Description: Toilet seat for water-closet-type fixture.

    a. Material: Molded, solid plastic with antimicrobial agent.
    b. Configuration: Open front without cover.
    c. Size: Elongated.

d. Hinge Type: SC, self-sustaining, check.
e. Color: White.

2.4 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key.

2.5 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with offset and straight tailpiece.

1. ADA compliant lavatories and sinks shall have offset tailpiece.

C. Trap:

1. Material: Chrome-plated and chrome-plated, brass or steel wall flange.
2. ADA-compliant lavatories and sinks shall have trap offset and installed close to wall.

2.6 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. McGuire Manufacturing Co., Inc.
b. Plumberex Specialty Products Inc.
c. TCI Products.
d. TRUEBRO, Inc.
e. Zurn Plumbing Products Group; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

2.7 FIXTURE SUPPORTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Josam Company.
2. Smith, Jay R. Mfg. Co.
3. Tyler Pipe; Wade Div.

4. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
5. Zurn Plumbing Products Group; Specification Drainage Operation.

B. Water-Closet Supports,:

1. Description: Combination carrier designed for accessible and standard mounting height of wall-mounting, water-closet-type fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

C. Lavatory Supports:

1. Description: Type II, lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

2.8 WATER CLOSETS

A. Water Closets:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard Companies, Inc.
b. Sloan.
c. Kohler Co.
d. TOTO USA, Inc.

2. Description: Refer to plumbing fixture schedule on drawings.

2.9 LAVATORIES

A. Lavatories:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard Companies, Inc.
b. Sloan.
c. Kohler Co.
d. TOTO USA, Inc.
e. Zurn.

2. Description: Refer to plumbing fixture schedule on drawings.

2.10 STAINLESS STEEL SINKS

A. Commercial Sinks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Tabco.
b. Dayton Products, Inc.
c. Elkay Manufacturing Co.

d. Franke Consumer Products, Inc., Kitchen Systems Div.
e. Just Manufacturing Company.
f. Kohler Co.

2. Description: Refer to plumbing fixture schedule on drawings.

2.11 SERVICE SINKS

A. Service Sinks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard Companies, Inc.
b. Eljer.
c. Kohler Co.

2. Description: Refer to plumbing fixture schedule on drawings.

2.12 WATER COOLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Elkay Manufacturing Co.
2. Halsey Taylor.
3. Haws Corporation.

B. Description: Accessible, ARI 1010, Type PB, pressure with bubbler, Style W, wall-mounting water cooler for adult-mounting height.

a. Cabinet: Bilevel with two attached cabinets, all stainless steel.
b. Bubbler: One, with adjustable stream regulator, located on each cabinet deck.
c. Control: Push bar.
d. Supply: NPS 3/8 with ball, gate, or globe valve.
e. Filter: One or more water filters complying with NSF 42 and NSF 53 for cyst and lead reduction to below EPA standards; with capacity sized for unit peak flow rate.
f. Drain(s): Grid with NPS 1-1/4 minimum horizontal waste and trap complying with ASME A112.18.1.
g. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.

1) Capacity: 8 gph of 50 deg F cooled water from 80 deg F inlet water and 90 deg F ambient air temperature.
2) Electrical Characteristics: [**1/6**] [**1/5**] [**1/4**] [**1/3**] hp; 120-V ac; single phase; 60 Hz.

h. Support: Type II, bilevel, hanger-type carrier with three vertical uprights.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install fixtures level and plumb according to roughing-in drawings.

G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

I. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

J. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

K. Install toilet seats on water closets.

L. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

M. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

N. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

O. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

P. Install escutcheons at piping wall and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Escutcheons for Plumbing Piping."

Q. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant.

R. Provide air chambers full size of pipe, but not less than 3/4" and not less than 12" long in all hot and cold water piping at each fixture.

1. Provide 1-1/4" x 18" long air chamber at each flush valve water closet.
2. Water hammer arrestors may be used in lieu of air chambers.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

D. Adjust water cooler temperature settings.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 22 4600

SECURITY PLUMBING FIXTURES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the plumbing drawings:

1) Stainless steel combination units.
2) Stainless steel showers.
3) Flushometer valves.
4) Supports.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 22 4000 – Plumbing Fixtures for faucets, flushometers, toilet seats, protective shielding guards, fixture supports, water closets, lavatories, stainless steel sinks, service sinks, electric water coolers.

1.3 DEFINITIONS

A. Accessible Service Space: Service area in secure space behind wall-mounted fixtures.

B. Back-Access Fixture: Security plumbing fixture designed to mount on wall sleeve built into wall or on wall, so installation and removal of fixture, piping, and other components are accessible only from service space behind wall.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for security plumbing fixtures.

2. Rated capacities, operating characteristics, and furnished specialties and accessories.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For security plumbing fixtures and components.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Flushometer-Valve Repair Kits: Equal to 10 percent of quantity of each type installed.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each product type from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Comply with ASME A112.19.3/CSA B45.4 for stainless steel plumbing fixtures.

B. Comply with ASSE 1037/ASME A112.1037/CSA B125.37 for flush valves.

C. Comply with ASME A112.19.5/CSA B45.15 for flush valves and spuds for water closets.

D. Comply with ASME A112.18.1/CSA B125.1 for plumbing supply fittings.

E. Comply with ASME A112.18.2/CSA B125.2 for plumbing waste fittings.

F. Comply with ASME A112.6.1M for plumbing fixture supports.

G. Comply with ICC A117.1 for ADA-compliant, accessible plumbing fixtures and installation.

H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

I. Faucets and bubblers intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61/NSF 372; or are certified in compliance with NSF 61/NSF 372 by an ANSI-accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.3 STAINLESS STEEL COMBINATION UNITS

A. Combination Units - Stainless Steel, Back Access, On Floor, Cabinet, with Water Closet and Lavatory: .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Acorn Engineering Company; a Division of Morris Group International.
    b. I-Con Systems, Inc.
    c. Metcraft Industries, Inc.
    d. Willoughby Industries, Inc.

2. Material: 14-gauge, Type 304 stainless steel, seamless welded construction, with fire-resistant sound-deadening material in cabinet interior. Toilet to be able to withstand a 5000 lb load without deflection and/or damage.
3. Finish: Satin polished finish on exposed surfaces.
4. Cabinet: Five-sided apron with two angled sides with backsplash.

    a. Water-Closet Bowl Location: Centered on front of apron.
    b. Toilet-Paper Holder: Recessed; stainless steel located in angled left side of apron.

5. Optional Features: Ligature resistant.
6. Accessories:

    a. Bubbler: On deck.

7. Mounting: Bolts through wall sleeve into accessible service space.
8. Water Closet:

    a. Bowl:

        1) Type: Elongated, with back inlet, integral trap, and blowout design with back outlet and integral contoured seat.
        2) Seat Surface: Satin polished finish.
        3) Punching: Two holes for installation of separate toilet seat.
        4) Outlet Connection: NPS 4, horizontal with cleanout and slip joint.

9. Lavatory:

    a. Location: In top of cabinet.
    b. Receptor: Oval bowl with integral soap depression.
    c. Hot- and Cold-Water and Bubbler Supply Valves: Pneumatic, push-button, hot and cold, metering type with individual check stops. Non-hold-open valve.
    d. Filler Spout: [**Backsplash**] [**or**] [**deck**] mounted.
    e. Drain: Integral punched grid with NPS 1-1/4 minimum waste and trap.

10. Wall Sleeve: Galvanized-steel frame of dimensions required to match fixture. Include steel bars or other design to prevent escape if fixture is removed.

2.4 STAINLESS STEEL SHOWERS

A. Showers - Stainless Steel, Back Access, Recessed: <**Insert drawing designation**>.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Acorn Engineering Company; a Division of Morris Group International.

b. I-Con Systems, Inc.
c. Metcraft Industries, Inc.
d. Willoughby Industries, Inc.

2. Fixture:

a. Material: 14-gauge, Type 304 stainless steel, seamless welded construction.
b. Finish: Satin polished finish on exposed surfaces.
c. Type and Configuration: Wall, with showerhead and soap dish.
d. Tempered-Water Supply Valves: Pneumatic, push-button, single-temperature, metering type with individual check stops. Non-hold-open valve.[**ADA compliant.**]
e. Soap Dish: Recessed, stainless steel.
f. Optional Features: ADA compliant and ligature resistant.

3. Mounting: Bolts through wall sleeve into accessible service space.
4. Wall Sleeve: Galvanized-steel frame of dimensions required to match fixture.

2.5 FLUSHOMETER VALVES

A. Flushometer Valves - Diaphragm: <**Insert designation**>.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advanced Modern Technologies Corporation - AMTC.
b. Delany Products.
c. Sloan Valve Company.
d. Zurn Industries, LLC.

2. Minimum Pressure Rating: 125 psig.
3. Features: Integral check stops and backflow-prevention device.
4. Material: Brass body with corrosion-resistant components.
5. Actuator: Hydraulic, push button.
6. Style: Concealed.
7. Finish: Panel and exposed surfaces, chrome plated or stainless steel.
8. Consumption: 1.6 gal. per flush.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install security plumbing fixtures level and plumb.

B. Install back-access, stainless steel fixtures as follows:

1. Install wall sleeve in wall if indicated.
2. Install fixture on wall sleeve or wall, as indicated, with access from accessible service space.
3. Extend supply piping from service space to fixture.
4. Install soil and waste piping from fixture and extend into service space.
5. Install fixture trap in service space instead of below fixture drain.

C. Install fixture outlets with gasket seals.

D. Install fixtures designated "accessible" in accordance with ICC A117.1 for heights, dimensions, and clearances.

E. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible fixtures. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

F. Seal joints between fixtures, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

G. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 PIPING CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with requirements for water piping specified in Section 221116 "Domestic Water Piping."

C. Comply with requirements for soil and waste drainage piping specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted in accordance with NFPA 70.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate to be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate to be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least [**1/2 inch**] <**Insert dimension**> high.

3.5 ADJUSTING

A. Operate and adjust flushometer valves and flow-control valves on fixtures. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at fixtures to produce proper flow.

C. Install new batteries in battery-powered, electronic-sensor mechanisms.

3.6 CLEANING AND PROTECTION

A. After installing fixtures, inspect and replace damaged finishes.

B. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed fixtures and fittings.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 22 6800

FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the plumbing drawings:

1) Pipes, tubes, and fittings.
2) Piping specialties.
3) Piping and tubing joining materials.
4) Valves.
5) Pressure regulators.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the plumbing drawings.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 65 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is 2 psig, and is reduced to secondary pressure of 0.5 psig or less.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Pipes, tubes and fittings.
2. Piping specialties.
3. Valves.
4. Pressure regulators.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. 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.

1.7 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of natural-gas service.
2. Do not proceed with interruption of natural-gas service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

    a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. OmegaFlex, Inc.
    b. Parker Hannifin Corporation; Parflex Division.
    c. Titeflex.
    d. Tru-Flex Metal Hose Corp.

2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.

3. Coating: PE with flame retardant.

    a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 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: 50 or less.

4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
5. Striker Plates: Steel, designed to protect tubing from penetrations.
6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
7. Operating-Pressure Rating: 5 psig.
8. CSST gas piping systems shall be bonded to the electrical service grounding electrode system. The bonding jumper shall not be smaller than 6 AWG copper wire.

C. Drawn-Temper Copper Tube: Comply with ASTM B 88, Type K.

1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
2. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of 0.022 inch thick.

D. PE Pipe: ASTM D 2513, SDR 11.

1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
3. Transition Service-Line Risers: Factory fabricated and leak tested.

    a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
    b. Outlet shall be threaded or suitable for welded connection.
    c. Bridging sleeve over mechanical coupling.
    d. Factory-connected anode.
    e. Tracer wire connection.
    f. Ultraviolet shield.
    g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

2.2 PIPING SPECIALTIES

A. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

B. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller.

3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

C. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in “Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

B. Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Crane.
    b. Conbraco Industries, Inc.; Apollo Div.
    c. McDonald, A. Y. Mfg. Co.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Separate pack nut or threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in “Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

C. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Lee Brass Company.
b. McDonald, A. Y. Mfg. Co.

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

D. Cast-Iron, Nonlubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. McDonald, A. Y. Mfg. Co.
b. Mueller Co.; Gas Products Div.
c. Xomox Corporation; a Crane company.

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 MOTORIZED GAS VALVES

A. Electrically Operated Valves: Comply with UL 429.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ASCO Power Technologies, LP; Division of Emerson.
b. Goyen Valve Corp.; Tyco Environmental Systems.
c. Magnatrol Valve Corporation.
d. Watts Regulator Co.; Division of Watts Water Technologies, Inc.

2. Pilot operated.
3. Body: Brass or aluminum.
4. Seats and Disc: Nitrile rubber.
5. Springs and Valve Trim: Stainless steel.
6. 120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable.
7. NEMA ICS 6, Type 4, coil enclosure.
8. Normally closed.
9. Visual position indicator.

2.6 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Meter Company.
   b. Fisher Control Valves and Regulators; Division of Emerson Process Management.
   c. Invensys.
   d. Maxitrol Company.
   e. Richards Industries; Jordan Valve Div.

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 2 psig.

2.7 DIELECTRIC UNIONS

A. Dielectric Unions

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. Hart Industries International, Inc.
   d. McDonald, A. Y. Mfg. Co.
   e. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
   f. Wilkins; Zurn Plumbing Products Group.

2. Description:

   a. Standard: ASSE 1079.
   b. Pressure Rating: 150 psig.
   c. End connections: Solder-joint copper alloy and threaded ferrous.

2.8 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 requirements for prevention of accidental ignition.

3.2 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling.

1. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.

C. Install underground, PE, natural-gas piping according to ASTM D 2774.

D. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
2. Replace pipe having damaged PE coating with new pipe.

E. Install fittings for changes in direction and branch connections.

F. Install pressure gage upstream and downstream from each service regulator. Pressure gages are specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

3.3 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

Q. Connect branch piping from top or side of horizontal piping.

R. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment.

S. Do not use natural-gas piping as grounding electrode.

T. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

U. Install pressure gage upstream and downstream from each line regulator. Pressure gages are specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for HVAC Piping."

X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.4 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing or copper connector.

B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.5 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.6 HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hangers and supports specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.

D. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.
2. NPS 1/2: Maximum span, 72 inches; minimum rod size, 3/8 inch.
3. NPS 3/4 and Larger: Maximum span, 96 inches; minimum rod size, 3/8 inch.

3.7 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70 and NFPA 54.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.8 LABELING AND IDENTIFYING

A. Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.9 PAINTING

A. Comply with requirements in Section 09 91 13 “Exterior Painting” and Section 09 91 23 “Interior Painting” for painting interior and exterior natural-gas piping.

B. Paint exposed, exterior metal piping, valves, service regulators, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

    a. Prime Coat: Alkyd anticorrosive metal primer.
    b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    c. Topcoat: Exterior alkyd enamel (flat).
    d. Color: Gray.

C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.10 FIELD QUALITY CONTROL

A. Test, inspect, and purge natural gas according to NFPA 54 and authorities having jurisdiction.

B. Natural-gas piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.11 OUTDOOR PIPING SCHEDULE

A. Underground natural-gas piping shall be one of the following:

1. PE pipe and fittings joined by heat fusion; service-line risers with tracer wire terminated in an accessible location.
2. Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

B. Aboveground natural-gas piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

3.12 INDOOR PIPING SCHEDULE

A. Aboveground, branch piping NPS 1-1/2 and smaller shall be[**one of**] the following:

1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
2. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be[**one of**] the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

C. Underground, below building, piping shall be[**one of**] the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

E. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

F. Branch Piping in Cast-in-Place Concrete to Single Appliance: Drawn-temper copper tube. Install piping embedded in concrete with no joints in concrete.

3.13 MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe at service meter shall be one of the following:

1. Pipe sizes NPS 2 and smaller;

    a. One-piece, full-port, bronze ball valve with bronze trim.
    b. Two-piece, full-port, bronze ball valves with bronze trim.
    c. Bronze plug valve.

2. Pipe sizes NPS 2-1/2 and larger;

    a. Two-piece, full-port, bronze ball valve with bronze trim.
    b. Bronze plug valve.
    c. Cast-iron, nonlubricated plug valve.

B. Distribution piping valves shall be[**one of**] the following:

1. Pipe sizes NPS 2 and smaller;

    a. One-piece, full-port, bronze ball valve with bronze trim.
    b. Two-piece, full-port, bronze ball valves with bronze trim.
    c. Bronze plug valve.

2. Pipe sizes NPS 2-1/2 and larger;

    a. Two-piece, full-port, bronze ball valve with bronze trim.
    b. Bronze plug valve.
    c. Cast-iron, nonlubricated plug valve.

C. Valves in branch piping for single appliance shall be[**one of**] the following:

1. One-piece, full-port, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

END OF SECTION

Preliminary

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PROJECT MANUAL

CHAMPAIGN COUNTY
SATELLITE JAIL
JAIL CONSOLIDATION

ITB #2022-009 SATELITE JAIL CONSOLIDATION PROJECT

502 S. Lierman Ave.
Urbana, IL 61802

ISSUE FOR BIDS

VOLUME 3

REIFSTECK REID

DATE: SEPTEMBER 14, 2022

RRCo PROJECT #202190

PROJECT MANUAL FOR

CHAMPAIGN COUNTY SATELLITE JAIL
JAIL CONSOLIDATION
ITB #2022-009 SATELITE JAIL CONSOLIDATION PROJECT
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VOLUME 1

VOLUME 2

VOLUME 3

VOLUME 4

MEP Specifier:
GHR Engineers & Associates Inc.
1615 S. Neil Street, Champaign, IL 61820
217.356.0536

SECTION 23 0500

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the HVAC drawings:

1) Piping materials and installation instructions common to most piping systems.
2) Transition fittings.
3) Dielectric fittings.
4) Mechanical sleeve seals.
5) Sleeves.
6) Escutcheons.
7) Grout.
8) Equipment installation requirements common to equipment sections.
9) Painting and finishing.
10) Concrete bases.
11) Supports and anchorages.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the HVAC drawings.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-dieneterpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.6 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

1.7 HAZARDOUS MATERIALS

A. No asbestos-containing materials may be used anywhere on this project.

B. No lead-based materials may be used anywhere on this project.

1.8 LOCATION OF EQUIPMENT

A. The approximate location of all equipment and pipe is shown on the drawings.

B. Architect / Engineer may change the location of any equipment or piping 5' in any direction without these changes being made the subject of an extra charge provided such changes are made before final installation.

C. Where offsets in piping, additional fittings, necessary drains, minor valves, traps, devices, etc., are required to complete the installation, to clear obstructions or the work of other Contractors or for the proper operation of the system, these shall be deemed to be included in the Contract and shall be furnished and installed complete by the Contractor at no additional charge.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

    a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.3 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

B. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

C. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Eclipse, Inc.
d. Epco Sales, Inc.
e. Hart Industries, International, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

1. Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:

a. Calpico, Inc.
b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:

a. Perfection Corp.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Co., Inc.
d. Victaulic Co. of America.

2.5 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

2.7 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated and rough brass.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated and rough brass.

E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.8 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
2. Insulated Piping: One-piece, stamped-steel type with spring clips.
3. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
4. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
5. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
6. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
7. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
8. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

   a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
   b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
   c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

      1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

P. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

Q. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Through-Penetration Firestop Systems" for materials.

S. Verify final equipment locations for roughing-in.

T. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 SPACE PREFERENCE

A. Coordinate the location and elevation of all work. Verify with all other Contractors to avoid conflicts.

B. In case of conflicts, the following installation priorities shall prevail:

1. Recessed electric fixtures
2. Sanitary / vent and storm drainage
3. Closed loop water piping
4. Low pressure ductwork
5. Domestic water lines
6. Sprinkler lines
7. Electric conduits

C. No other work shall have preference over plumbing lines below fixtures.

D. No other work shall have preference over bus duct or conduit above or below electric switchgear and panels.

E. No piping conveying fluids shall be installed directly over electrical or elevator equipment.

3.6 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03.

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.9 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION

SECTION 23 0513

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the HVAC drawings:

1) MAU, RTU and Pump Motors.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the HVAC drawings.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Inverter duty rated at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Insulation: Class F.

H. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

I. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.

2. Split phase.
3. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the HVAC drawings:

1) Steel pipe hangers and supports.
2) Trapeze pipe hangers.
3) Metal framing systems.
4) Thermal-hanger shield inserts.
5) Fastener systems.
6) Pipe stands.
7) Equipment supports.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the HVAC drawings.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Fiberglass pipe hangers.
3. Thermal-hanger shield inserts.
4. Powder-actuated fastener systems.

B. Shop Drawings: Show fabrication and installation details for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Pipe stands. Include Product Data for components.
4. Equipment supports.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
5. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.

12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

B. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

C. Nonmetallic Coatings: Plastic coating, jacket, or liner.

D. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 ENGINEERED SUPPORT SYSTEM INSTALLED AT EXISTING PLASTER CEILINGS

A. An engineered support system shall be furnished and installed per Specification Section 05 43 00 and drawing CTR.003 S41-20 by assigned contractor (assignment by construction manager).

Contractor shall furnish and install all necessary steel supports and associated mounting and fastening hardware to support all Division 23 items requiring support from above (diffusers, ductwork, piping, etc).

3.2 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS ½ to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS ½ to NPS 24, if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS ½ to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS ½ to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS ½ to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS ½ to NPS 2.
10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS ½ to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
16. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.

18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.3 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

M. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
b. NPS 4: 12 inches long and 0.06 inch thick.
c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.4 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.5 METAL FABRICATIONS

A. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with 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. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.6 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.7 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 23 0548

VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the plumbing drawings:

1) Elastomeric isolation pads.
2) Elastomeric isolation mounts.
3) Restrained elastomeric isolation mounts.
4) Open-spring isolators.
5) Housed-spring isolators.
6) Restrained-spring isolators.
7) Housed-restrained-spring isolators.
8) Pipe-riser resilient support.
9) Resilient pipe guides.
10) Air-spring isolators.
11) Restrained-air-spring isolators.
12) Elastomeric hangers.
13) Spring hangers.
14) Snubbers.
15) Restraints - rigid type.
16) Restraints - cable type.
17) Restraint accessories.
18) Post-installed concrete anchors.
19) Concrete inserts.
20) Vibration isolation equipment bases.
21) Restrained isolation roof-curb rails.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 21 0548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" for devices for fire-suppression equipment and systems.
2. Section 22 0548 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for devices for plumbing equipment and systems.

1.3 DEFINITIONS

A. Designated Seismic System: An HVAC component that requires design in accordance with ASCE/SEI 7, Ch. 13, and for which the Component Importance Factor is greater than 1.0.

B. IBC: International Building Code.

C. OSHPD: Office of Statewide Health Planning and Development (State of California).

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component.
3. Annotate types and sizes of seismic restraints and accessories, complete with listing markings or report numbers and load rating in tension and compression as evaluated by ICC-ES product listing, UL product listing, OSHPD or an agency acceptable to authorities having jurisdiction.
4. Annotate to indicate application of each product submitted and compliance with requirements.
5. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated Design Submittals:

1. For each seismic-restraint wind-load protection device that is required by this Section:

a. Seismic Restraint, and Vibration Isolation Base Selection: Select vibration isolators, seismic restraints, and vibration isolation bases complying with performance requirements, design criteria, and analysis data.
b. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification by professional engineer that riser system was examined for excessive stress and that none exists.
c. Concrete Anchors and Inserts: Include calculations showing anticipated seismic and wind loads. Include certification that device is approved by an NRTL for seismic reinforcement use.
d. Seismic Design Calculations: Submit all input data and loading calculations prepared under "Seismic Design Calculations" Paragraph in "Performance Requirements" Article.
e. Qualified Professional Engineer: All designated-design submittals for seismic- and wind-restraint calculations are to be signed and sealed by qualified professional engineer responsible for their preparation.

2. Seismic-Restraint Detail Drawing:

   a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
   b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.

3. All delegated design submittals for seismic-restraint detail Drawings are to be signed and sealed by qualified professional engineer responsible for their preparation.
4. Product Listing, Preapproval, and Evaluation Documentation: By UL, OSHPD or an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and basis for approval (tests or calculations).
5. Design Calculations for Vibration Isolation Devices: Calculate static and dynamic loading due to equipment weight and operating forces required to select proper vibration isolators, and to design vibration isolation bases.
6. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and spring deflection changes. Include certification that riser system was examined for excessive stress and that none exists.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer and testing agency.

B. Field quality-control reports.

C. Seismic Qualification Data: Provide special certification for designated seismic systems as indicated in [**ASCE/SEI 7-05,**] [**ASCE/SEI 7-10,**] [**ASCE/SEI 7-16,**] Paragraph 13.2.2, "Special Certification Requirements for Designated Seismic Systems" for all Designated Seismic Systems identified as such on Drawings or in the Specifications.

   1. Provide equipment manufacturer's written certification for each designated active mechanical seismic device and system, stating that it will remain operable following the design earthquake.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For seismic restraints to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct testing indicated, be an NRTL as defined by OSHA in 29 CFR 1910.7, and be acceptable to authorities having jurisdiction.

B. Seismic-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing

directory available to the public. Provide third-party listing by one or more of the following: ICC-ES product listing, UL product listing or an agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic load control system.
   1. Seismic Performance: Equipment to withstand the effects of earthquake motions determined in accordance with [**ASCE/SEI 7-05**] [**ASCE/SEI 7-10**] [**ASCE/SEI 7-16**].

B. Seismic Design Calculations:

   1. Perform calculations to obtain force information necessary to properly select seismic-restraint devices, fasteners, and anchorage. Perform calculations using methods acceptable to applicable code authorities and as presented in [**ASCE/SEI 7-05**] [**ASCE/SEI 7-10 including supplement No. 1**] [**ASCE/SEI 7-16**]. Where "ASCE/SEI 7" is used throughout this Section, it is to be understood that the edition referred to in this subparagraph is the edition intended as reference throughout the Section Text.

      a. Data indicated below to be determined by Delegated Design Contractor must be obtained by Contractor and must be included in individual component submittal packages.
      b. Building Occupancy Category: [**I**] **[II**] [**III**] [**IV**].
      c. Building Risk Category: [**I**] [**II**] [**III**] [**IV**].
      d. Building Site Classification: [**A**] [**B**] [**C**] [**D**] [**E**] [**F**].
      e. Seismic Design Category: [**A**] [**B**] [**C**] [**D**] [**E**] [**F**].

C. Consequential Damage: Provide additional seismic restraints for suspended HVAC components or anchorage of floor-, roof-, or wall-mounted HVAC components as indicated in [**ASCE/SEI 7-05**] [**ASCE/SEI 7-10**] [**ASCE/SEI 7-16**] so that failure of a non-essential or essential HVAC component will not cause failure of any other essential architectural, mechanical, or electrical building component.

D. Fire/Smoke Resistance: Seismic-restraint devices that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL in accordance with ASTM E84 or UL 723, and be so labeled.

E. Component Supports:

   1. Load ratings, features, and applications of all reinforcement components must be based on testing standards of a nationally recognized testing agency.
   2. All component support attachments must comply with force and displacement resistance requirements of [**ASCE 7-05 Section 13.6**] [**ASCE/SEI 7-10 Section 13.6**] [**ASCE/SEI 7-16 Section 13.6**].

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Mason Industries
    b. Kinetics Noise Control, Inc.

2. Source Limitations: Obtain elastomeric isolation pads from single manufacturer.
3. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
4. Size: Factory or field cut to match requirements of supported equipment.
5. Pad Material: Oil and water resistant with elastomeric properties. Neoprene rubber, silicone rubber, or other elastomeric material.
6. Surface Pattern: Smooth, ribbed, or waffle pattern.

    a. Surface Pattern: Smooth, ribbed, or waffle pattern.
    b. Infused nonwoven cotton or synthetic fibers.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts: .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Mason Industries
    b. Kinetics Noise Control, Inc.

2. Source Limitations: Obtain double-deflection, elastomeric isolation mounts from single manufacturer.
3. Mounting Plates:

    a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded.

4. Elastomeric Material: Molded, oil- and water-resistant neoprene rubber, silicone rubber, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts: .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Mason Industries
    b. Kinetics Noise Control, Inc.

2. Source Limitations: Obtain restrained elastomeric isolation mounts from single manufacturer.
3. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

    a. Housing: Cast-ductile iron or welded steel.

b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators: .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.

2. Source Limitations: Obtain freestanding, laterally stable, open-spring isolators from single manufacturer.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates limit floor load to 500 psig.
8. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.6 HOUSED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.

2. Source Limitations: Obtain freestanding, laterally stable, open-spring isolators in two-part telescoping housing from single manufacturer.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

   a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases limit floor load to 500 psig.
   b. Top housing with attachment and leveling bolt, threaded mounting holes and internal leveling device or elastomeric pad.

2.7 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Source Limitations: Obtain restrained-spring isolators from single manufacturer.
3. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

    a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases limit floor load to 500 psig.
    b. Top plate with threaded mounting holes or elastomeric pad.
    c. Internal leveling bolt that acts as blocking during installation.

4. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
5. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
6. Minimum Additional Travel: 50 percent of the required deflection at rated load.
7. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
8. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.8 HOUSED-RESTRAINED-SPRING ISOLATORS

A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Source Limitations: Obtain freestanding, open-spring isolators with vertical-limit stop restraints from single manufacturer.
3. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with snubbers to limit vertical movement.

    a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases limit floor load to 500 psig.
    b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.

4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.9 PIPE-RISER RESILIENT SUPPORT

A. All-Directional, Acoustical Pipe Anchor Consisting of Two Steel Tubes Separated by a Minimum 1/2-inch-Thick Neoprene: .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Source Limitations: Obtain all-directional, acoustical pipe anchor from single manufacturer.
3. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
4. Maximum Load Per Support: 500 psig on isolation material providing equal isolation in all directions.

2.10 RESILIENT PIPE GUIDES

A. Telescopic Arrangement of Two Steel Tubes or Post and Sleeve Arrangement Separated by a Minimum 1/2-inch-Thick Neoprene:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Source Limitations: Obtain resilient pipe guides from single manufacturer.
3. Factory-Set Height Guide with Shear Pin: Shear pin to be removable and reinsertable to allow for selection of pipe movement. Guides to be capable of motion to meet location requirements.

2.11 AIR-SPRING ISOLATORS

A. Freestanding, Single or Multiple, Compressed-Air Bellows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Source Limitations: Obtain air-spring isolators from single manufacturer.
3. Bellows Assembly: Upper and lower powder-coated steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows or similar elastomeric material.
4. Maximum Natural Frequency: 3 Hz.
5. Operating Pressure Range: 25 to 100 psig.

6. Burst Pressure: At least three times manufacturer's published maximum operating pressure.

2.12 RESTRAINED-AIR-SPRING ISOLATORS

A. Freestanding, Single or Multiple, Compressed-Air Bellows with Vertical-Limit Stop Restraint:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Source Limitations: Obtain restrained-air-spring isolators from single manufacturer.
3. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

    a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases limit floor load to 500 psig.
    b. Top plate with threaded mounting holes or elastomeric pad.
    c. Internal leveling bolt that acts as blocking during installation.

4. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
8. Bellows Assembly: Upper and lower powder-coated steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows or similar elastomeric material.
9. Maximum Natural Frequency: 3 Hz.
10. Operating Pressure Range: 25 to 100 psig.
11. Burst Pressure: At least three times manufacturer's published maximum operating pressure.

2.13 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Source Limitations: Obtain elastomeric hangers from a single manufacturer.
3. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
4. Damping Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.14 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Source Limitations: Obtain spring hangers from single manufacturer.
3. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
8. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.

2.15 SNUBBERS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

B. Source Limitations: Obtain snubbers from single manufacturer.

C. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Post-Installed Concrete Anchor Bolts: Secure to concrete surface with post-installed concrete anchors. Anchors to be seismically prequalified in accordance with ACI 355.2 testing and designated in accordance with [**ACI 318-08 Appendix D for 2009 IBC**] [**ACI 318-11 Appendix D for 2012 IBC**] [**ACI 318-14 Ch. 17 for 2015 or 2018 IBC**].
2. Preset Concrete Inserts: Seismically prequalified in accordance with ICC-ES AC446 testing.
3. Anchors in Masonry: Design in accordance with TMS 402.
4. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
5. Resilient Cushion: Maximum 1/4-inch air gap, and minimum 1/4 inch thick.

2.16 RESTRAINTS - RIGID TYPE

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

B. Source Limitations: Obtain rigid-type restraints from single manufacturer.

C. Description: Shop- or field-fabricated bracing assembly made of AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe as per NFPA 13, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.17 RESTRAINTS - CABLE TYPE

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

B. Source Limitations: Obtain cable-type restraints from single manufacturer.

C. Seismic-Restraint Cables: ASTM A1023/A1023M galvanized or ASTM A603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic-restraining cable service; with fittings attached by means of poured socket, swaged socket or mechanical (Flemish eye) loop.

D. Restraint cable assembly with cable fittings must comply with ASCE/SEI 19. All cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.18 RESTRAINT ACCESSORIES

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

B. Source Limitations: Obtain restraint accessories from single manufacturer.

C. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Non-metallic stiffeners are unacceptable.

D. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.

E. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

F. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

G. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.19 POST-INSTALLED CONCRETE ANCHORS

A. Mechanical Anchor Bolts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Source Limitations: Obtain mechanical anchor bolts from single manufacturer.
3. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength for anchor and as tested according to ASTM E488/E488M.

B. Adhesive Anchor Bolts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

2. Source Limitations: Obtain adhesive anchor bolts from single manufacturer.
3. Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.

C. Provide post-installed concrete anchors that have been prequalified for use in wind-load applications. Post-installed concrete anchors must comply with all requirements of [**ASCE/SEI 7-05, Ch. 13**] [**ASCE/SEI 7-10, Ch. 13**] [**ASCE/SEI 7-16, Ch. 13**].

1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.

2.20 CONCRETE INSERTS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

B. Source Limitations: Obtain concrete inserts from single manufacturer.

C. Provide preset concrete inserts that are seismically prequalified in accordance with ICC-ES AC466 testing.

D. Comply with ANSI/MSS SP-58.

2.21 VIBRATION ISOLATION EQUIPMENT BASES

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

B. Source Limitations: Obtain vibration isolation equipment bases from single manufacturer.

C. Steel Rails: Factory-fabricated, welded, structural-steel rails.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide rails.
    a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A36/A36M. Rails to have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

D. Steel Bases: Factory-fabricated, welded, structural-steel bases and rails.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.

    a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A36/A36M. Bases to have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

E. Concrete Inertia Base: Factory-fabricated or field-fabricated, welded, structural-steel bases and rails ready for placement of cast-in-place concrete.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.

    a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A36/A36M. Bases to have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

2.22 RESTRAINED ISOLATION ROOF-CURB RAILS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

B. Source Limitations: Obtain restrained isolation roof-curb rails from single manufacturer.

C. Description: Factory-assembled, fully enclosed, insulated, air- and watertight curb rail designed to resiliently support equipment and to withstand seismic forces.

D. Upper Frame: To provide continuous support for equipment and to be captive to resiliently resist seismic forces.

E. Lower Support Assembly: To be formed sheet metal section containing adjustable and removable steel springs that support the upper frame. Lower support assembly to have a means for attaching to building structure and a wood nailer for attaching roof materials, and to be insulated with a minimum of 2 inches of rigid, glass-fiber insulation on inside of assembly. Mount adjustable, restrained-spring isolators on elastomeric vibration isolation pads and provide access ports, for level adjustment, with removable waterproof covers at all isolator locations. Locate isolators so they are accessible for adjustment at any time during the life of the installation without interfering with integrity of roof.

F. Snubber Bushings: All-directional, elastomeric snubber bushings at least 1/4 inch thick.

G. Water Seal: Galvanized sheet metal with EPDM seals at corners, attached to upper support frame, extending down past wood nailer of lower support assembly, and counterflashed over roof materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by OSHPD or an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.3 INSTALLATION OF VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICES

A. Provide vibration-control devices for systems and equipment where indicated in Equipment Schedules or Vibration-Control Devices Schedules, where indicated on Drawings, or where Specifications indicate they are to be installed on specific equipment and systems.

B. Provide seismic-restraint devices for systems and equipment where indicated in Equipment Schedules or Seismic-Restraint Devices Schedules, where indicated on Drawings, where Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.

C. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

D. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

E. Equipment Restraints:

1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
3. Install seismic-restraint devices using methods approved by OSHPD or an agency acceptable to authorities having jurisdiction that provides required submittals for component.

F. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

G. Ductwork Restraints:

1. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with ASCE/SEI 7.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.
4. Select seismic-restraint devices with capacities adequate to carry static and seismic loads.
5. Install cable restraints on ducts that are suspended with vibration isolators.

H. Install seismic-restraint cables so they do not bend across edges of adjacent equipment or building structure.

I. Install seismic-restraint devices using methods approved by OSHPD or an agency acceptable to authorities having jurisdiction that provides required submittals for component.

J. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

K. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

L. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

M. Mechanical Anchor Bolts:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors to be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive-Type Anchor Bolts: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Provide flexible connections in piping systems where they cross structural seismic joints and other point where differential movement may occur. Provide adequate flexibility to accommodate differential movement as determined in accordance with ASCE/SEI 7. Comply with requirements in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties" for piping flexible connections.

3.5 INSTALLATION OF AIR-SPRING ISOLATORS

A. Independent Isolator Installation:

1. Install tank valve into each air isolator.
2. Inflate each isolator to height and pressure required by code.

3.6 INSTALLATION OF VIBRATION ISOLATION EQUIPMENT BASES

A. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate dimensions of steel equipment rails and bases, concrete inertia bases, and restrained isolation roof-curb rails with requirements of isolated equipment specified in this and other Sections. Where dimensions of these bases are indicated on Drawings, dimensions may require adjustment to accommodate actual isolated equipment.

3.7 ADJUSTING

A. Adjust isolators after system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

3.8 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. Perform tests and inspections with the assistance of a factory-authorized service representative.
2. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
3. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven days' advance notice.
4. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
5. Test no fewer than four of each type and size of installed anchors and fasteners selected by Architect.
6. Test to 90 percent of rated proof load of device.
7. Measure isolator restraint clearance.
8. Measure isolator deflection.
9. Verify snubber minimum clearances.
10. Test and adjust restrained-air-spring isolator controls and safeties.

C. Remove and replace malfunctioning units and retest as specified above.

D. Units will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION

SECTION 23 0553

IDENTIFICATION FOR HVAC PIPE AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the HVAC drawings:

1) Equipment labels.
2) Warning signs and labels.
3) Pipe labels.
4) Valve tags.
5) Warning tags.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the HVAC drawings.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.3 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Outdoor Equipment:

1. Material and Thickness: Stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, ½ inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Indoor Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Blue.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, ½ inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, ½ inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link chain, beaded chain or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

B. Pipe Label Schedule:

1. Hot Water Supply Heating. . . . . .HWSH
2. Hot Water Return Heating. . . . . .HWRH
3. Vents. V
4. Drain. . . . . .D
5. Refrigerant Liquid. . . . . RL
6. Refrigerant Suction. . . . . RS
7. Chilled Water Supply. . . . . .CHWS
8. Chilled Water Return. . . . . .CWR

    a. Background Color: Green.
    b. Letter Color: White.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves and valves within factory-fabricated equipment units. List tagged valves in a valve schedule.

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 23 0593

PIPING AND AIR SYSTEMS TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid

1. Contractor: Test, adjust and balance air and piping systems. Work includes but is not limited to the following.

    a. Hydronic systems
    b. Air systems
    c. Control system tests
    d. Reports

B. Alternate Bid:

1. Contractor

    a. Alternate Bid No. 1: Does not apply.
    b. Alternate Bid No. 2

        (1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the HVAC drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Sections: Architectural / Structural and General Work:
2. Division 23 - Mechanical
3. Division 26 - Electrical

1.3 JOB CONDITIONS

A. Heating, ventilating, and air conditioning equipment shall be completely installed and in continuous operation to accomplish the testing, adjusting and balancing work specified. Complete air balancing prior to hydronic balancing.

B. Perform testing, adjusting and balancing when outside conditions approximate design conditions for heating and cooling functions or when the system is operating at design capacity.

C. The Architect / Engineer may be present during testing and balancing to verify that specified procedures are followed.

1.4 QUALITY ASSURANCE

A. Testing and balancing shall be performed by independent firms specializing in such work.

B. Only qualified personnel shall perform testing and balancing work.

C. Submit evidence that the personnel who will perform the testing and balancing of the project systems are qualified personnel for review by the Architect / Engineer prior to performing the work.

D. Submit a list of completed projects successfully tested and balanced by the submitted qualified personnel for review by the Architect / Engineer, prior to performing the work.

E. Perform all corrective measures caused by faulty installation. Retest, readjust and rebalance systems until satisfactory results are achieved.

1.5 DEFINITION

A. Qualified personnel are:

1. Personnel who have been certified by one of the following test and balance organizations.

a. AABC - Associated Air Balance Council.
b. Certified TBAB - Certified Testing, Balancing and Adjusting Bureau.
c. NEBB - National Environmental Balancing Bureau, Illinois Chapter.
d. SMARTA - Sheet Metal, Air Conditioning & Roofing Contractors Trade Association of Illinois.
e. TABIC - Test & Balancing Institute for Certification.

1.6 SUBMITTALS

A. Submit data sheets on each item of testing equipment for Architect / Engineer review. Include name of device, manufacturer's name, model number, latest date of calibration and correction factors.

B. Submit a report containing all test data and other related information recorded during testing and balancing, placed on appropriate forms for Architect / Engineer review. Reports shall certify that the methods used and results achieved are as specified.

1.7 REVERIFICATION

A. During Substantial Completion Inspection, a percentage (not more than 5%) of the recorded data will be subject to reverification by the Architect / Engineer. Take instrument readings as directed. Test points will be in normally accessible locations and randomly selected by Architect / Engineer.

PART 2 - PRODUCTS

2.1 WATER BALANCING INSTRUMENTS

A. 30" Mercury U-Tube Manometer, 200 psig wwp, with three valve bypass assembly and return wells or mercury check valves.

B. Inspector's Gauge Testing Set.

C. Water Differential Pressure Gauge, 4.50" dial.

D. Pressure gauge measurements points, quick-connect couplings, 1/4" ips.

2.2 AIR BALANCE INSTRUMENTS

A. Velometer with probes and Pitot tube.

B. Rotating vane anemometer.

C. ASHRAE standard Pitot tubes stainless steel 5/16 outside diameter, lengths 18" and 36".

D. Magnehelic differential air pressure gauges, 0 to 0.5", 0 to 1.0" and 0 to 5.0" water pressure ranges, each arranged as a portable unit for use with a standard Pitot tube.

E. Combination inclined-vertical portable manometer, range 0 to 5.0" water.

F. Portable-type hook gauge, range 0 to 12" water.

G. Portable flexible U-tube manometer, magnetic mounting clips, range 0 to 18" water.

H. Conical or pyramidal shaped hood.

2.3 SYSTEM PERFORMANCE MEASURING INSTRUMENTS

A. Insertion thermometers, with graduations at 0.1°F or contact pyrometer.

B. Sling psychrometer.

C. Tachometer, centrifugal type.

D. Revolution counter.

E. Clamp-on volt-ammeter.

F. Recorders, portable type for temperature and humidity.

PART 3 - EXECUTION

3.1 DRIVES

A. All VAV systems shall be provided with new, appropriately sized drives such that the full range of the pertinent VFD's is available for control of duct static pressure. VAV systems shall not be balanced using the VFD's.

3.2 AIR SYSTEMS

A. Test, adjust and balance systems in accord with the following:

1. Preliminary:

   a. Identify and list size, type and manufacturer of all equipment to be tested, including air terminals. Inspect all system components for proper installation and operation.
   b. Use manufacturers' ratings for all equipment to make calculations except where field test shows ratings to be impractical.
   c. Verify that all instruments are accurately calibrated and maintained.
   d. Install clean filters.

2. Central System:

   a. Test, adjust and record supply, return fan RPM to design requirements within the limits of mechanical equipment provided.
   b. Test and record motor voltage and running amperes including motor nameplate data and starter heater ratings.
   c. Make pitot tube traverse of main supply, exhaust and return ducts, determine and record cfm at fans and adjust fans to design cfm.
   d. Test and record system static pressure, suction and discharge.
   e. Test and adjust system for design minimum outside air, cfm.

f. Test and adjust systems for design return air, cfm.
g. Test and record heating apparatus entering air temperatures, dry bulb.
h. Test and record cooling apparatus entering air temperatures, dry bulb and wet bulb.
i. Test and record heating apparatus leaving air temperatures, dry bulb.
j. Test and record cooling apparatus leaving air temperatures, dry bulb and wet bulb.

3. Distribution: Adjust zones or branch ducts to proper design cfm, supply and return.
4. Air Terminals:

a. Identify each air terminal from reports as to location and determine required flow reading.
b. Test and adjust each air terminal to within 10% of design requirement.
c. Test procedure on air terminals shall include comparison of specified fpm velocity and observed velocity, adjustment of terminal and comparison of specified cfm and observed cfm after adjustment.
d. Adjust flow patterns from air terminal units to minimize drafts to extent design and equipment permits.

5. Verification:

a. Prepare summation of readings of observed cfm for each system, compare with specified cfm and verify that duct losses are within specified allowable range. Determine coil and filter static pressure drops.
b. Verify design cfm at fans as described above.

3.3 TESTING, BALANCING AND ADJUSTING

A. At the completion of the installation of the air distribution systems, the following tests shall be made.

B. All instruments for testing are to be furnished by this Contractor and must be reviewed by the Architect / Engineer before use on job. All readings shall be recorded on approved forms. All instruments used shall be recently calibrated and same set of instruments shall be used throughout the balancing procedures.

C. The air distribution systems shall be balanced with the volume dampers, splitter dampers and adjustable air extractors in the duct systems as follows:

1. All air handling equipment in building shall be operating during the balancing procedures. Supply systems with return fans shall be balanced in the 100% outside air position. System shall then be set in minimum outside air position and manual volume damper after automatic return air dampers adjusted to maintain constant supply air volume. Supply systems without return fans shall be adjusted to the minimum outside air position. All filters shall be new and clean. All volume dampers and extractors shall be set at 2/3 open position.
2. Fans shall be adjusted to specified air quantities by using rotating vane anemometer traverse over entering air face of cooling coils in built-up air handling systems, with pitot tube and inclined manometer or a velometer having proper duct jet attachment for traverse at fan inlet.
3. Individual outlets shall be adjusted to specified air quantities using either the "proportional method" starting at last outlet and working towards main or the "trial and error" method, with a velometer having proper attachment or a rotating vane anemometer.
4. Branch ducts (having more than one outlet) shall be adjusted to specified air quantities by using a pitot tube and inclined anemometer or a velometer having proper duct jet attachment for traverse as near to takeoff as practical.

5. Above procedures shall essentially be followed for all systems and shall be repeated until proper balance is achieved throughout systems from -0% to +10% of specified air quantities.

D. After balance is completed, lock nuts or stop screws shall be installed at all volume dampers and extractors to permit them to be shut-off but prevent opening beyond the set balance position.

E. For more detailed step-by-step procedures the Balancing and Adjustment Manual for Air Distribution Systems published by Sheet Metal and Air Conditioning Contractors National Association shall be used.

F. All readings taken throughout the balancing procedure shall be recorded on approved forms and upon completion of balancing and testing shall be "certified" as being correct and submitted for review.

G. Upon receipt of "certified" balancing forms and letter of certification that all balancing, testing and adjusting is completed in accordance with plans and specifications and that all systems are operating properly, the Architect / Engineer or his designated representative will conduct a balance inspection. Furnish personnel, instruments and equipment as required to assist the Architect / Engineer during this "balance inspection".

H. If during the above balance inspection any portion of any system is found in improper balance, that entire system shall be rebalanced and a new report submitted. The rebalance shall be checked and if again found in improper balance, this Contractor shall again rebalance and submit report. This procedure shall be repeated until the systems are properly balanced to the satisfaction of the Architect / Engineer.

3.4 HYDRONIC HEATING SYSTEMS

A. Test, adjust and balance system in accordance with the following requirements:

1. Preliminary:

   a. List all mechanical specifications of tested equipment and verify against contract documents. Inspect all system components for proper installation and operation. Clean all screens.
   b. Open all line valves to full open position. Close coil bypass stop valves, then set mixing control valve to full coil flow.
   c. For each pump, verify rotation, test, and record pump shut-off head, and test and record pump wide-open head.
   d. Verify proper water level in expansion tanks and in the system. Verify that system is entirely full of fluid. Vent all air vents.
   e. Verify that air vents in high points of water systems are installed and operating freely.
   f. Verify that all instruments are accurately calibrated and maintained.

2. Central Equipment:

   a. Set chilled water and hot water pumps to proper flow quantity.
   b. Adjust flow of chilled water through chiller to design value.
   c. Adjust flow of hot water through heat exchangers to design quantity.
   d. Adjust steam pressure at PRV and record at each steam heat exchanger.
   e. Observe leaving water temperatures and return water temperatures at chiller and heat exchangers. Reset to correct design temperatures.
   f. Record pump operating suction and discharge pressures. Determine final dynamic head.

3. Distribution:

   a. Balance flow to each chilled water coil and hot water coil.
   b. Record steam pressure at each steam coil.

4. Terminal Units

   a. Upon completion of flow readings and adjustments at coils, mark all settings and record following data:

      (1) Inlet water temperatures.
      (2) Leaving water temperatures.

   b. Observe fluid pressure drop through coil at set flow rate on call for full cooling and for full heating.
   c. Set valve in bypass to match coil flow pressure drop on full bypass.

5. Verification:

   a. Record rated and actual running amperage for each pump motor. Measure and record gpm of all pumps.
   b. Record total dynamic head for each pump.

3.5 AUTOMATIC CONTROL SYSTEM

A. The Contractor shall set and adjust automatically operated devices to achieve specified sequence of operation.

B. Testing organization shall verify all controls for proper calibration and list those controls requiring adjustment by temperature control system installer.

3.6 SYSTEM PERFORMANCE REPORT

A. After the conclusion of balancing operations, make temporary installation of portable recorders and simultaneously record temperatures and humidity during summer and winter conditions at representative locations in each system.

B. Architect / Engineer will direct all test locations.

C. Make recordings during summer and winter for a seven-day period, continuous over a weekend, and including at least one period of operation at outside conditions within 5°F wet bulb temperature of maximum summer design condition and within 10°F dry bulb temperature of minimum winter design condition.

D. Report of test results shall include original recording and two reproductions.

3.7 SUBMISSION OF REPORTS

A. Fill in test results on approved forms.

B. Submit three certified copies of required test reports to the Architect / Engineer for review.

C. Include in report a list of instruments used and test date of calibration.

D. Submittals shall be legibly signed by the individual(s) responsible for the accuracy of the

END OF SECTION

SECTION 23 0700

HVAC INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid

1. Provide and install complete insulation systems as shown on the drawings and as specified herein. Work includes, but is not limited to, the following:

a. Contractor: Insulating of:

(1) Hot water heating piping
(2) Chilled water piping
(3) Refrigerant piping
(4) Ductwork

B. Alternate Bid

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2

(1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the HVAC drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Division 23 - Mechanical Systems

1.3 QUALITY ASSURANCE

A. Installations shall be by qualified personnel thoroughly trained and experienced in the skills required and completely familiar with the manufacturer's current recommended methods of installation as well as the requirements of the work.

B. All insulation shall be applied in accordance with MICA "Commercial and Industrial Insulation Standards".

1.4 SUBMITTALS

A. See Architectural Sections.

B. Provide submittals for:

1. Pipe insulation
2. Equipment insulation
3. Plastic insulation jacket
4. Duct insulation

PART 2 - PRODUCTS

2.1 INSULATION

A. Materials of insulation shall be manufactured by Johns-Manville, Schuller, Owens Corning, Knauf, Rubatex, Armstrong, Certain-Teed (acceptable manufacturers will vary depending upon material being specified herein after).

B. Insulation shall be rigid glass fiber with fire retardant vapor barrier jacket. Insulation of fittings shall be in accordance with manufacturer's recommendations using glass fiber wrapping and formed jacket.

C. Insulating materials and APT jackets shall conform to latest NFPA and IECC standards with flame-spread rating not to exceed 25 and smoke developed rating not to exceed 50. Vapor barrier jackets shall have a water vapor permeability rating not to exceed .02 perms when tested in accordance with ASTM Standard E-96.

D. Flexible fire retardant elastomeric thermal insulation for use on refrigerant piping and equipment in cold piping systems (strainers, pumps, special valves) shall be manufactured by Armstrong, Schuller or Rubatek. Insulation shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less. Seal all joints with appropriate adhesive. On equipment, such as strainers, the insulation shall be installed so that those portions of the equipment which require servicing will have removable sections for access.

1. Do not use elastomeric insulation on surfaces that exceed 120°F.
2. Contractors shall be responsible for ensuring that use of this material in return air plenums is in full compliance with all codes and is acceptable to the authority having jurisdiction. This matter shall be resolved before shop drawings are submitted.
3. Elastomeric insulation shall not be used on two-pipe heating / cooling.

E. Specialties

1. All hot piping fittings and cold fittings and flanges shall be wrapped with low density glass fiber blanket insulation built up to same thickness as adjacent insulation and wired in place with 20 gauge copper clad annealed wire. Cover with plastic pre-fab jacket and seal joint and end overlaps with white nylon tape.
2. All cold water valves, control valves, unions and other fittings requiring access shall be insulated with elastomeric foam or fiberglass of the same thickness and type as the rest of the system.
3. Covering on all pipe fittings shall be notched on the interior of fittings and shall pass unbroken through hangers and pipe sleeves.
4. Valves, unions, relief valves and strainers shall be insulated.
5. Valves, unions, strainers and flanges in heating hot water piping need not be covered. Insulation shall be tapered back, neatly cemented and covered same as fittings to permit access to the joint, valve and strainer without disturbing covering.
6. Insulation and vapor barrier on cold piping systems shall be continuous and shall prevent condensation and water problems.
7. All piping carrying cold fluid shall be insulated with elastomeric insulation coated with two coats of paintable coating where exposed to UV light indoors. Cover elastomeric insulation with PVC jacket outdoors and where exposed to abrasions in light traffic areas indoors and outdoors.

F. Equipment - Hot

1. Insulate equipment with operating temperature to 450°F insulate with high density (3pcf min.) fiberglass. K-Factor 0.27 max at 75°F, thickness as specified. Attach using 16 gauge copper clad annealed wire or weld pins and washers 12" on center.

2. Finish for equipment heads and irregular surface where jacketed fiberglass insulation is used shall be as follows: Apply 10-10 fiberglass mesh with coat of fire retardant mastic. Apply second coat of fire retardant mastic over mesh for smooth finish.

ITEMS	THICKNESS
Hot Water Air Separator	2" Fiberglass

G. Equipment - Cold

1. Insulate the following equipment with 1" thick layer of fire retardant elastomeric insulation having a flame-spread rating of less than 25 in accordance with the latest NFPA standards.

ITEMS
Chilled Water Pumps
Chilled Water Strainers

2. Insulation shall be applied with a full coating of adhesive, as recommended by the manufacturer.
3. The insulation on all pumps and strainers shall be easily removable for service.
4. Do not use elastomeric on surfaces that exceed 120°F.

H. Piping

1. Covering on all piping shall pass unbroken through hangers and pipe sleeves with insulation protection saddles. Molded fiberglass saddles shall be directly adhered to insulation jacket using an appropriate glue.

a. Acceptable Manufacturers:

(1) Buckaroos, Inc.
(2) Pipeshield, Inc.
(3) B-Line Systems, Inc.
(4) Centerline

2. Where section of water pipe 2-1/2" and larger passes through hangers, provide fiberglass plug inserts to prevent crushing of insulation. Size of pipe shall indicate number of plug to insert, i.e., 2" = 2 plugs, 4" = 4 plugs, etc. Provide 7¼ lbs. density insulation on pipe 2" and smaller extending 6" beyond ends of metal jacket. Insulation shall be of same thickness as specified material. Vapor barrier shall not be damaged.

a. Acceptable Manufacturers:

(1) Buckaroos, Inc.
(2) Pipeshield, Inc.
(3) B-Line Systems, Inc.
(4) Centerline

3. All laps in jacket shall be on top of horizontal pipes and toward the wall in vertical pipes and shall be sealed with staples and flame retardant adhesive. Laps shall be a minimum of 3" at end joints and 1-1/2" on longitudinal joints.
4. Insulate the following piping as described below, or as noted on drawings:
5. Apply 3-1/2 lb minimum density, 0.27 maximum k factor / inch fiberglass pipe insulation on piping systems.
6. Apply 3-1/2 lb minimum density, 0.27 maximum k factor / inch fiberglass pipe insulation on piping systems in accordance with the following:

HWSH - Hot Water Supply Heating

HWRH - Hot Water Return Heating
HWRRH - Hot Water Reverse Return Heating

PIPE SIZE	INSULATION THICKNESS
1-1/2" and less	1-1/2"
2" and greater	2"

LPS - Low Pressure Steam Piping
LPR - Low Pressure Return Piping

PIPE SIZE	INSULATION THICKNESS
1-1/2" and less	1-1/2"
2" and greater	2"

CHWS - Chilled Water Supply
CHWR - Chilled Water Return
CHWRR - Chilled Water Reverse Return

PIPE SIZE	INSULATION THICKNESS
All Sizes	1-1/2"

7. Apply elastomeric foam pipe insulation on piping systems in accordance with the following maximum k factor 0.27 / inch:

   Refrigerant piping and all VRF equipment piping
   Drain lines from cooling equipment

PIPE SIZE	INSULATION THICKNESS
All	1"

8. Apply elastomeric foam pipe insulation on piping system in accord with the following maximum k factor 0.27 / inch (can be used in lieu of fiberglass if allowed by Code):

   CHWS, CHWR
   Cold Control Valves

PIPE SIZE	INSULATION THICKNESS
All Sizes	1-1/2"

9. Seal ends of insulation and inside surface of insulation to pipe every 21' on straight runs, at each side of fittings and valves and at all equipment.
10. Insulation on piping in concealed locations may use permanently treated (not salt treatment) flame-retardant jacket. Jackets on hot lines in concealed locations may be stapled without use of adhesive as specified above.

2.2 MINERAL-FIBER INSULATION INSTALLATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. Impale insulation over pins and attach speed washers.
f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.

   a. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
   b. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

   a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
   b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
   c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

d. Do not overcompress insulation during installation.
e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

PART 3 - EXECUTION

3.1 INSULATING PIPING

A. Provide all pipe covering, thermal insulation, protective jacketing, saddles, shields and plugs for the systems in their contracts as specified. Work shall be performed by skilled mechanics regularly engaged in the application of pipe insulation.

B. No insulation shall be applied until all pressure tests have been successfully completed.

3.2 PIPING OUTDOORS

A. Pipe insulation installed outdoors shall be protected by:

   1. Weathertight aluminum jacketing for piping greater than 2". Provide PVC jacketing for piping 2" and smaller.

B. Elastomeric 1-1/2" thick pipe insulation installed outdoors shall be protected by aluminum jacketing or PVC jacketing.

3.3 DUCT INSULATION

A. Supply, outdoor, relief air (between dampers and outdoors) and exhaust air (between dampers and outdoors) duct insulation shall be the following:

   1. Mineral Fiber Blanket: 1-1/2 inches thick, 1.0 lb / cu. ft. nominal density.

B. Access doors and fire dampers shall be insulated with the following:

   1. Mineral Fiber Blanket: 1-1/2 inches thick, 1.0 lb / cu. ft. nominal density.

C. Exposed ductwork in finished areas shall be insulated with the following:

1. Mineral Fiber Board Insulation: 1-1/2 inches thick, ~~2~~ **3** lb / cu. ft. nominal density.
2. Board insulation to be painted shall have all service jacket.
3. Board insulation not to be painted shall have foil jacket.
4. Supply ductwork from heating only make-up air units does not require duct insulation. The discharge air temperature shall not exceed in a difference of 15 degrees F compared to the surrounding space temperature.
5. Exposed round ductwork to be double wall insulated spiral.

D. Finish areas include storage rooms, server rooms and bus

E. Concealed type 1 kitchen hood exhaust duct and plenum insulation shall be fire-rated blanket or board; thickness as required to achieve 2 hour fire rating.

F. Generator exhaust and muffler insulation shall be fire-rated blanket or board; thickness as required to achieve 2 hour fire rating.

END OF SECTION

SECTION 23 0900

INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the HVAC drawings:

1) Controls systems and hardware for control of HVAC systems.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the HVAC drawings.

1.2 RELATED WORK

A. Related Sections include the following:

1. Division 23 Section "Meters and Gages for HVAC Piping" for measuring equipment that relates to this Section.
2. Division 23 Section "Sequence of Operations for HVAC Controls" for requirements that relate to this Section.

1.3 DEFINITIONS

A. DDC: Direct digital control.

B. I/O: Input/output.

C. LonWorks: A control network technology platform for designing and implementing interoperable control devices and networks.

D. MS/TP: Master slave/token passing.

E. PC: Personal computer.

F. PID: Proportional plus integral plus derivative.

G. RTD: Resistance temperature detector.

H. IP: Internet protocol.

1.4 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 10 seconds.
2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 8 seconds.
3. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.
4. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.
5. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within five seconds of each other.
6. Program Execution Frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.
7. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.
8. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:

    a. Water Temperature: Plus or minus 1 deg F.
    b. Water Flow: Plus or minus 5 percent of full scale.
    c. Water Pressure: Plus or minus 2 percent of full scale.
    d. Space Temperature: Plus or minus 1 deg F.
    e. Ducted Air Temperature: Plus or minus 1 deg F.
    f. Outside Air Temperature: Plus or minus 2 deg F.
    g. Dew Point Temperature: Plus or minus 3 deg F.
    h. Temperature Differential: Plus or minus 0.25 deg F.
    i. Airflow (Pressurized Spaces): Plus or minus 3 percent of full scale.
    j. Airflow (Measuring Stations): Plus or minus 5 percent of full scale.
    k. Air Pressure (Space): Plus or minus 0.01-inch wg.
    l. Air Pressure (Ducts): Plus or minus 0.1-inch wg.
    m. Carbon Dioxide: Plus or minus 50 ppm.
    n. Electrical: Plus or minus 5 percent of reading.

1.5 SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation equipment, interface equipment, control units, transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.
2. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications.
3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Bill of materials of equipment indicating quantity, manufacturer, and model number.
2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
3. Wiring Diagrams: Power, signal, and control wiring.
4. Details of control panel faces, including controls, instruments, and labeling.
5. Written description of sequence of operation.
6. Schedule of dampers including size, leakage, and flow characteristics.
7. Schedule of valves including flow characteristics.
8. DDC System Hardware:

    a. Wiring diagrams for control units with termination numbers.
    b. Schematic diagrams and floor plans for field sensors and control hardware.
    c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.

9. Control System Software: List of color graphics indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.
10. Controlled Systems:

    a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
    b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
    c. Written description of sequence of operation including schematic diagram.
    d. Points list.

C. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with ASHRAE 135.

D. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with LonWorks.

E. Samples for Initial Selection: For each color required, of each type of thermostat or sensor cover with factory-applied color finishes.

F. Samples for Verification: For each color required, of each type of thermostat or sensor cover.

G. Software and Firmware Operational Documentation: Include the following:

1. Software operating and upgrade manuals.
2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.
5. Software license required by and installed for DDC workstations and control systems.

H. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.

I. Qualification Data: For Installer and manufacturer.

J. Field quality-control test reports.

K. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.
2. Interconnection wiring diagrams with identified and numbered system components and devices.
3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
5. Calibration records and list of set points.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with ASHRAE 135 for DDC system components.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where the equipment manufacturer's factory packaged controls are capable of providing the BAS interface specified, the equipment manufacturer's controls may be utilized. Where controls are provided by other than the equipment manufacturer, arrange for shipping of required devices to equipment manufacturer for factory mounting as required for proper equipment function.

B. System Software: Update to latest version of software at Project completion.

1.8 COORDINATION

A. Coordinate location of thermostats and other exposed control sensors with plans and room details before installation.

B. Coordinate equipment with Division 27 Section "Clock Systems" to achieve compatibility with equipment that interfaces with that system.

C. Coordinate equipment with Division 26 Section "Network Lighting Controls" to achieve compatibility with equipment that interfaces with that system.

D. Coordinate equipment with Division 28 Section "Fire Detection and Alarm" to achieve compatibility with equipment that interfaces with that system.

E. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.

F. Coordinate equipment with Division 26 Section "Electrical Power Monitoring and Control" to achieve compatibility of communication interfaces.

G. Coordinate equipment with Division 26 Section "Panelboards" to achieve compatibility with starter coils and annunciation devices.

H. Coordinate equipment with Division 26 Section "Motor-Control Centers" to achieve compatibility with motor starters and annunciation devices.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Replacement Materials: One replacement for each unique valve motor, controller, thermostat, positioning relay.
2. Maintenance Materials: Five thermostat adjusting key(s).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CONTROL SYSTEM

A. Manufacturers:

1. Alpha Controls.

B. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories to control mechanical systems.

C. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems. An operator workstation shall permit interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

D. Expand existing temperature control system software database to include all new controlled mechanical equipment. Control system shall be accessible via campus Ethernet network.

2.3 DDC EQUIPMENT

A. Operator Workstation and Printer: Existing operator workstation and printer are to be retained.

1. Application Software: Modify existing temperature control software as necessary to provide the level of control specified herein for new and existing equipment and systems.

a. I/O capability from operator station.
b. System security for each operator via software password and access levels.
c. Automatic system diagnostics; monitor system and report failures.
d. Database creation and support.
e. Automatic and manual database save and restore.
f. Dynamic color graphic displays with up to 10 screen displays at once.
g. Custom graphics generation and graphics library of HVAC equipment and symbols.

h. Alarm processing, messages, and reactions.
i. Trend logs retrievable in spreadsheets and database programs.
j. Alarm and event processing.
k. Object and property status and control.
l. Automatic restart of field equipment on restoration of power.
m. Data collection, reports, and logs. Include standard reports for the following:

1) Current values of all objects.
2) Current alarm summary.
3) Disabled objects.
4) Alarm lockout objects.
5) Logs.

n. Custom report development.
o. Utility and weather reports.
p. Workstation application editors for controllers and schedules.
q. Maintenance management.

2. Custom Application Software:

a. English language oriented.
b. Full-screen character editor/programming environment.
c. Allow development of independently executing program modules with debugging/simulation capability.
d. Support conditional statements.
e. Support floating-point arithmetic with mathematic functions.
f. Contains predefined time variables.

B. Diagnostic Terminal Unit: Portable notebook-style, PC-based microcomputer terminal capable of accessing system data by connecting to system network with minimum configuration as follows:

1. System: With one integrated USB 2.0 port, integrated Intel Pro 10/100 (Ethernet), integrated audio, bios, and hardware monitoring.
2. Processor: Core 2, 2.0 GHz.
3. Random-Access Memory: 1.0 GB.
4. Graphics: Video adapter, minimum 1024 x 768 pixels, 64-MB video memory.
5. Monitor: 15 inches, LCD color.
6. Keyboard: QWERTY 105 keys in ergonomic shape.
7. Hard-Disk Drive: 80 Gb.
8. CD-ROM Read/Write Drive: 48x24x48.
9. Pointing Device: Touch pad or other internal device.

C. Control Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory; local operator access and display panel; integral interface equipment; and backup power source.

1. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation or diagnostic terminal unit.
2. Stand-alone mode control functions operate regardless of network status. Functions include the following:

a. Global communications.
b. Discrete/digital, analog, and pulse I/O.
c. Monitoring, controlling, or addressing data points.
d. Software applications, scheduling, and alarm processing.
e. Testing and developing control algorithms without disrupting field hardware and controlled environment.

3. Standard Application Programs:

    a. Electric Control Programs: Demand limiting, duty cycling, automatic time scheduling, start/stop time optimization, night setback/setup, on-off control with differential sequencing, staggered start, antishort cycling, PID control, DDC with fine tuning, and trend logging.
    b. HVAC Control Programs: Optimal run time, supply-air reset, and enthalpy switchover.
    c. Programming Application Features: Include trend point; alarm processing and messaging; weekly, monthly, and annual scheduling; energy calculations; run-time totalization; and security access.
    d. Remote communications.
    e. Maintenance management.
    f. Units of Measure: Inch-pound and SI (metric).

4. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.
5. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.
6. LonWorks Compliance: Control units shall use LonTalk protocol and communicate using EIA/CEA 709.1 datalink/physical layer protocol.

D. Local Control Units: Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.

1. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.
2. Stand-alone mode control functions operate regardless of network status. Functions include the following:

    a. Global communications.
    b. Discrete/digital, analog, and pulse I/O.
    c. Monitoring, controlling, or addressing data points.

3. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.
4. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.
5. LonWorks Compliance: Control units shall use LonTalk protocol and communicate using EIA/CEA 709.1 datalink/physical layer protocol.

E. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.

1. Binary Inputs: Allow monitoring of on-off signals without external power.
2. Pulse Accumulation Inputs: Accept up to 10 pulses per second.
3. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.
4. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation with three-position (on-off-auto) override switches and status lights.
5. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA) with status lights, two-position (auto-manual) switch, and manually adjustable potentiometer.
6. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.
7. Universal I/Os: Provide software selectable binary or analog outputs.

F. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:

1. Output ripple of 5.0 mV maximum peak to peak.
2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

G. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:

1. Minimum dielectric strength of 1000 V.
2. Maximum response time of 10 nanoseconds.
3. Minimum transverse-mode noise attenuation of 65 dB.
4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.

2.4 UNITARY CONTROLLERS

A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.

1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72-hour battery backup.
2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform scheduling with real-time clock. Perform automatic system diagnostics; monitor system and report failures.
3. ASHRAE 135 Compliance: Communicate using read (execute and initiate) and write (execute and initiate) property services defined in ASHRAE 135. Reside on network using MS/TP datalink/physical layer protocol and have service communication port for connection to diagnostic terminal unit.
4. LonWorks Compliance: Communicate using EIA/CEA 709.1 datalink/physical layer protocol using LonTalk protocol.
5. Enclosure: Dustproof rated for operation at 32 to 120 deg F.
6. Enclosure: Waterproof rated for operation at 40 to 150 deg F.

2.5 ANALOG CONTROLLERS

A. Step Controllers: 6- or 10-stage type, with heavy-duty switching rated to handle loads and operated by electric motor.

B. Electric, Outdoor-Reset Controllers: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range, adjustable set point, scale range minus 10 to plus 70 deg F, and single- or double-pole contacts.

C. Electronic Controllers: Wheatstone-bridge-amplifier type, in steel enclosure with provision for remote-resistance readjustment. Identify adjustments on controllers, including proportional band and authority.

1. Single controllers can be integral with control motor if provided with accessible control readjustment potentiometer.

D. Fan-Speed Controllers: Solid-state model providing field-adjustable proportional control of motor speed from maximum to minimum of 55 percent and on-off action below minimum fan speed. Controller shall briefly apply full voltage, when motor is started, to rapidly bring motor up to minimum speed. Equip with filtered circuit to eliminate radio interference.

2.6 ELECTRONIC SENSORS

A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

B. Thermistor Temperature Sensors and Transmitters:

1. Manufacturers:

   a. BEC Controls Corporation.
   b. Ebtron, Inc.
   c. Heat-Timer Corporation.
   d. I.T.M. Instruments Inc.
   e. MAMAC Systems, Inc.
   f. RDF Corporation.

2. Accuracy: Plus or minus 0.5 deg F at calibration point.
3. Wire: Twisted, shielded-pair cable.
4. Insertion Elements in Ducts: Single point; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft..
5. Averaging Elements in Ducts: 72 inches long, flexible; use where prone to temperature stratification or where ducts are larger than 10 sq. ft..
6. Insertion Elements for Liquids: Brass or stainless-steel socket with minimum insertion length of 2-1/2 inches.
7. Room Sensor Cover Construction: Manufacturer's standard locking covers.

   a. Set-Point Adjustment: Concealed.
   b. Set-Point Indication: Exposed.
   c. Thermometer: Red-reading glass.

8. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
9. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

C. RTDs and Transmitters:

1. Manufacturers:

   a. BEC Controls Corporation.
   b. MAMAC Systems, Inc.
   c. RDF Corporation.

2. Accuracy: Plus or minus 0.2 percent at calibration point.
3. Wire: Twisted, shielded-pair cable.
4. Insertion Elements in Ducts: Single point, 8 inches or 18 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft..
5. Averaging Elements in Ducts: 48 inches long, rigid; use where prone to temperature stratification or where ducts are larger than 9 sq. ft.; length as required.
6. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.
7. Room Sensor Cover Construction: Manufacturer's standard locking covers.

   a. Set-Point Adjustment: Concealed.
   b. Set-Point Indication: Exposed.
   c. Thermometer: Red-reading glass.

8. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
9. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

D. Humidity Sensors: Bulk polymer sensor element.

1. Manufacturers:

   a. BEC Controls Corporation.
   b. General Eastern Instruments.
   c. MAMAC Systems, Inc.
   d. ROTRONIC Instrument Corp.
   e. TCS/Basys Controls.
   f. Vaisala.

2. Accuracy: 5 percent full range with linear output.
3. Room Sensor Range: 20 to 80 percent relative humidity.
4. Room Sensor Cover Construction: Manufacturer's standard locking covers.

   a. Set-Point Adjustment: Exposed.
   b. Set-Point Indication: Exposed.

5. Duct Sensor: 20 to 80 percent relative humidity range with element guard and mounting plate.
6. Outside-Air Sensor: 20 to 80 percent relative humidity range with mounting enclosure, suitable for operation at outdoor temperatures of minus 22 to plus 185 deg F.
7. Duct and Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

E. Pressure Transmitters/Transducers:

1. Manufacturers:

   a. BEC Controls Corporation.
   b. General Eastern Instruments.
   c. MAMAC Systems, Inc.
   d. ROTRONIC Instrument Corp.
   e. TCS/Basys Controls.
   f. Vaisala.

2. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.

   a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
   b. Output: 4 to 20 mA.
   c. Building Static-Pressure Range: 0- to 0.25-inch wg.
   d. Duct Static-Pressure Range: 0- to 5-inch wg.

3. Water Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure; linear output 4 to 20 mA.
4. Water Differential-Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure and tested to 300-psig; linear output 4 to 20 mA.
5. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential.
6. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; linear output 4 to 20 mA.

F. Room Sensor Cover Construction: Manufacturer's standard locking covers.

1. Set-Point Adjustment: Exposed.
2. Set-Point Indication: Exposed.

G. Room sensor accessories include the following:

1. Insulating Bases: For sensors located on exterior walls.
2. Adjusting Key: As required for calibration and cover screws.

H. Photocell, see Section 23 0993 for description.

2.7 STATUS SENSORS

A. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch wg.

B. Status Inputs for Pumps: Differential-pressure switch with pilot-duty rating and with adjustable pressure-differential range of 8 to 60 psig, piped across pump.

C. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.

D. Voltage Transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.

E. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.

F. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.

G. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

H. Water-Flow Switches: Bellows-actuated mercury or snap-acting type with pilot-duty rating, stainless-steel or bronze paddle, with appropriate range and differential adjustment, in NEMA 250, Type 1 enclosure.

1. Manufacturers:

a. BEC Controls Corporation.
b. I.T.M. Instruments Inc.

2.8 GAS DETECTION EQUIPMENT

A. Manufacturers:

1. B. W. Technologies.
2. CEA Instruments, Inc.
3. Ebtron, Inc.
4. Gems Sensors Inc.
5. Greystone Energy Systems Inc.
6. Honeywell International Inc.; Home & Building Control.

7. INTEC Controls, Inc.
8. I.T.M. Instruments Inc.
9. MSA Canada Inc.
10. QEL/Quatrosense Environmental Limited.
11. Sauter Controls Corporation.
12. Sensidyne, Inc.
13. TSI Incorporated.
14. Vaisala.
15. Vulcain Inc.

B. Carbon Dioxide Sensor and Transmitter: Single detectors using solid-state infrared sensors; suitable over a temperature range of 23 to 130 deg F and calibrated for 0 to 2 percent, with continuous or averaged reading, 4- to 20-mA output;, for wall mounting.

C. Oxygen Sensor and Transmitter: Single detectors using solid-state zircon cell sensing; suitable over a temperature range of minus 32 to plus 1100 deg F and calibrated for 0 to 5 percent, with continuous or averaged reading, 4- to 20-mA output; for wall mounting.

D. Occupancy Sensor: Passive infrared, with time delay, daylight sensor lockout, sensitivity control, and 180-degree field of view with vertical sensing adjustment; for flush mounting.

2.9 THERMOSTATS

A. Manufacturers:

1. Same as Direct Digital Controller Manufacturer.

B. Combination Thermostat and Fan Switches: Line-voltage thermostat with push-button or lever-operated fan switch.

1. Label switches "FAN ON-OFF".
2. Mount on single electric switch box.

C. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.

D. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch or equivalent solid-state type, with heat anticipator; listed for electrical rating; with concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.

1. Electric Heating Thermostats: Equip with off position on dial wired to break ungrounded conductors.
2. Selector Switch: Integral, manual on-off-auto.

E. Remote-Bulb Thermostats: On-off or modulating type, liquid filled to compensate for changes in ambient temperature; with copper capillary and bulb, unless otherwise indicated.

1. Bulbs in water lines with separate wells of same material as bulb.
2. Bulbs in air ducts with flanges and shields.
3. Averaging Elements: Copper tubing with either single- or multiple-unit elements, extended to cover full width of duct or unit; adequately supported.
4. Scale settings and differential settings are clearly visible and adjustable from front of instrument.
5. On-Off Thermostat: With precision snap switches and with electrical ratings required by application.

6. Modulating Thermostats: Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.

F. Fire-Protection Thermostats: Listed and labeled by an NRTL acceptable to authorities having jurisdiction; with fixed or adjustable settings to operate at not less than 75 deg F above normal maximum operating temperature, and the following:

1. Reset: Manual.
2. Reset: Automatic, with control circuit arranged to require manual reset at central control panel; with pilot light and reset switch on panel labeled to indicate operation.

G. Immersion Thermostat: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range and adjustable set point.

H. Airstream Thermostats: Two-pipe, fully proportional, single-temperature type; with adjustable set point in middle of range, adjustable throttling range, plug-in test fitting or permanent pressure gage, remote bulb, bimetal rod and tube, or averaging element.

I. Electric, Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic- reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point.

1. Bulb Length: Minimum 20 feet.
2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

J. Electric, High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic- reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or above set point.

1. Bulb Length: Minimum 20 feet.
2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

K. Heating/Cooling Valve-Top Thermostats: Proportional acting for proportional flow, with molded-rubber diaphragm, remote-bulb liquid-filled element, direct and reverse acting at minimum shutoff pressure of 25 psig, and cast housing with position indicator and adjusting knob.

L. Thermostats shall be provided by the Contractor and compatible with the BAS. Night setback and thermostat settings shall be controlled by BAS.

2.10 HUMIDISTATS

A. Manufacturers:

1. MAMAC Systems, Inc.
2. ROTRONIC Instrument Corp.

B. Duct-Mounting Humidistats: Electric insertion, 2-position type with adjustable, 2 percent throttling range, 20 to 80 percent operating range, and single- or double-pole contacts.

2.11 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

1. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

2. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
3. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running torque of 150 in. X lbf and breakaway torque of 300 in. X lbf.
4. Spring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running and breakaway torque of 150 in. X lbf.
5. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. X lbf and breakaway torque of 300 in. X lbf.
6. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. X lbf.

B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.

1. Manufacturers:

   a. Schneider Electric.

2. Valves: Size for torque required for valve close off at maximum pump differential pressure.
3. Dampers: Size for running torque calculated as follows:

   a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
   b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
   c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft of damper.
   d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
   e. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
   f. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.

4. Coupling: V-bolt and V-shaped, toothed cradle.
5. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
6. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.
7. Power Requirements (Two-Position Spring Return): 24-V ac.
8. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
9. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
10. Temperature Rating: Minus 22 to plus 122 deg F.
11. Temperature Rating (Smoke Dampers): Minus 22 to plus 250 deg F.
12. Run Time: 12 seconds open, 5 seconds closed.

2.12 CONTROL VALVES

A. Manufacturers:

1. Schneider Electric.
2. Siemens.
3. Honeywell.

B. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

C. Hydronic system globe valves shall have the following characteristics:

1. NPS 2 and Smaller: Class 125 bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity repackable under pressure.
2. NPS 2-1/2 and Larger: Class 125 iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc.
3. Internal Construction: Replaceable plugs and stainless-steel or brass seats.

    a. Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom.
    b. Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom.

4. Sizing: 3-psig maximum pressure drop at design flow rate or the following:

    a. Two Position: Line size.
    b. Two-Way Modulating: Either the value specified above or twice the load pressure drop, whichever is more.
    c. Three-Way Modulating: Twice the load pressure drop, but not more than value specified above.

5. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.
6. Close-Off (Differential) Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150 percent of total system (pump) head for two-way valves and 100 percent of pressure differential across valve or 100 percent of total system (pump) head.

D. Butterfly Valves: 200-psig, 150-psig maximum pressure differential, ASTM A 126 cast-iron or ASTM A 536 ductile-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals.

1. Body Style: Wafer.
2. Disc Type: Aluminum bronze.
3. Sizing: 1-psig maximum pressure drop at design flow rate.

2.13 DAMPERS

A. Manufacturers:

1. Air Balance Inc.
2. Don Park Inc.; Autodamp Div.
3. TAMCO (T. A. Morrison & Co. Inc.).
4. United Enertech Corp.
5. Vent Products Company, Inc.

B. Dampers: AMCA-rated, opposed-blade design; 0.108-inch- minimum thick, galvanized-steel or 0.125-inch- minimum thick, extruded-aluminum frames with holes for duct mounting; damper blades shall not be less than 0.064-inch- thick galvanized steel with maximum blade width of 8 inches and length of 48 inches.

1. Secure blades to 1/2-inch- diameter, zinc-plated axles using zinc-plated hardware, with oil-impregnated sintered bronze blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40 to plus 200 deg F.
3. Edge Seals, Standard Pressure Applications: Closed-cell neoprene.
4. Edge Seals, Low-Leakage Applications: Use inflatable blade edging or replaceable rubber blade seals and spring-loaded stainless-steel side seals, rated for leakage at less than 10

cfm per sq. ft. of damper area, at differential pressure of 4-inch wg when damper is held by torque of 50 in. X lbf; when tested according to AMCA 500D.

2.14 CONTROL CABLE

A. Electronic and fiber-optic cables for control wiring are specified in Division 27 Section "Communications Horizontal Cabling."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that conditioned power supply is available to control units and operator workstation.

B. Verify that pneumatic piping and duct-, pipe-, and equipment-mounted devices are installed before proceeding with installation.

3.2 INSTALLATION

A. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

B. Connect and configure equipment and software to achieve sequence of operation specified.

C. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above the floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

D. Install guards on thermostats in the following locations:

1. Entrances.
2. Public areas.
3. Where indicated.

E. Install automatic dampers according to Division 23 Section "Air Duct Accessories."

F. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

G. Install labels and nameplates to identify control components according to Division 23 Section "Identification for HVAC Piping and Equipment."

H. Install hydronic instrument wells, valves, and other accessories according to Division 23 Section "Hydronic Piping."

I. Install refrigerant instrument wells, valves, and other accessories according to Division 23 Section "Refrigerant Piping."

J. Install duct volume-control dampers according to Division 23 Sections specifying air ducts.

K. Install electronic and fiber-optic cables according to Division 27 Section "Communications Horizontal Cabling."

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Division 26 Section "Raceway and Boxes for Electrical Systems."

B. Install building wire and cable according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Install signal and communication cable according to Division 27 Section "Communications Horizontal Cabling."

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway.
3. Install concealed cable in raceway.
4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safeties.
3. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
4. Test each point through its full operating range to verify that safety and operating control set points are as required.
5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
6. Test each system for compliance with sequence of operation.
7. Test software and hardware interlocks.

C. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
2. Check instruments for proper location and accessibility.
3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check instrument tubing for proper fittings, slope, material, and support.

5. Check installation of air supply for each instrument.
6. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.
7. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
8. Check temperature instruments and material and length of sensing elements.
9. Check control valves. Verify that they are in correct direction.
10. Check DDC system as follows:

    a. Verify that DDC controller power supply is from emergency power supply, if applicable.
    b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
    c. Verify that spare I/O capacity has been provided.
    d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.5 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.
2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
4. Control System Inputs and Outputs:

    a. Check analog inputs at 0, 50, and 100 percent of span.
    b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
    c. Check digital inputs using jumper wire.
    d. Check digital outputs using ohmmeter to test for contact making or breaking.
    e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Flow:

    a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
    b. Manually operate flow switches to verify that they make or break contact.

6. Pressure:

    a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
    b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.

7. Temperature:

    a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
    b. Calibrate temperature switches to make or break contacts.

8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.

9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
10. Provide diagnostic and test instruments for calibration and adjustment of system.
11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

DDC INPUT/OUTPUT SUMMARY TABLE

Building: **Satellite Jail**	HARDWARE															
	OUTPUT							INPUT								
Systems	Digital					Analog		Digital			Analog					
Occupied Time: Scheduled	Start/Stop	Enable/Disable	Open/Close	Hand/Off/Auto	Status Light	Control	Manual Override	Status	Status Light	Alarm	Temperature	Pressure	Flow	Humidity	CO^2	Set Point Adjustment
AHU's																
Supply Fan VFD		X				X	X	X		X		X				
Relief/Return Fan VFD		X				X	X	X		X						
Freeze stat										X						
Smoke detector (3)										X						
Min OA Dpr.			X													
Return Air											X	X		X	X	X
Mixed Air						X	X				X					X
Heating coil						X	X				X					X
Discharge Air						X	X				X	X		X		X
Tube Heater						X	X				X					
Cooling Coil						X	X				X					X
CHWS/CHWR Temp.											X					
Clg Coil Discharge											X					
Filter Status												X				
Reheats											X					X
Chiller & Pumps	X	X				X	X	X			X					X
Boiler		X									X					
Exhaust Fans	X					X	X	X								
UH						X	X				X					X
Dom HW Recirc Pump	X	X				X	X	X			X					
HWCP																
Outdoor Air											X			X		
Building Pressure												X				

	ALARM						SOFTWARE: APPLICATION PROGRAMS																				
	Digital			Analog																							
Systems	Equipment Alarm	High Limit	Low Limit	High Limit	Low Limit	Run Time	Failure Mode *	Scheduled Start/Stop	Optimal Start/Stop	Duty Cycling	Demand Limiting	Night Setback	Economizer	CFM Control	Cold Deck Reset	Hot Deck Reset	Chilled Water Reset	Hot Water Reset	Cond Water Reset	Chiller Sequencing	Smoke Control	System Integration	Global Data Sharing	Color Graphics	Totalization	Trend	Point History
AHU's							X		X				X				X	X						X	X	X	X
Supply Fan VFD	X	X		X	X		X																X	X		X	X
Relief/Return Fan VFD	X		X																				X	X		X	X
Freeze stat	X																						X	X		X	X
Smoke detector (3)	X																						X	X			X
Min OA Dpr.																							X	X			X
Return Air				X	X																		X	X		X	X
Mixed Air					X																		X	X		X	X
Heating coil				X	X																		X	X		X	X
Discharge Air				X	X																		X	X		X	X
Tube Heater																										X	
Cooling Coil				X																			X	X		X	X
CHWS/CHWR Temp.																							X	X		X	X
Clg Coil Discharge																							X	X		X	X
Filter Status	X																						X	X		X	X
Reheats		X	X										X										X	X		X	X
Chiller & Pumps	X	X	X			X											X			X			X	X		X	X
Boiler																		X									
Exhaust Fans	X																						X	X		X	X
UH																							X	X		X	X
Dom HW Recirc Pump	X											X											X	X		X	X
HWCP																											
Outdoor Air																							X	X		X	X
Building Pressure																											

NOTES: 1. Occupant & BAS adjust 2. 3. 4. C. Last command F. Off/Closed H. High Value O. On/Open

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SECTION 23 0993

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the HVAC drawings:

1) Control sequences for HVAC equipment control systems.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the HVAC drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 23 0900 - HVAC Instrumentation and Control for control equipment and devices and for submittal requirements.

1.3 DEFINITIONS

A. DDC: Direct digital control.

1.4 CONTROLLED SYSTEMS

A. This system is intended to provide automatic control of the following systems and equipment. Control systems shall be complete with all items of labor and material necessary to give specified performance.

1. All unit heaters
2. All exhaust fans
3. Hot water heating system pumps and boilers
4. Chilled water system pumps
5. All air handling units
6. Reheat coils

7. Chiller

1.5 AIR HANDLING UNITS

A. The AHU's shall come complete with VFD provided and installed by Contractor. The Contractor shall provide and field install DDC controllers. The variable volume air handling unit consists of a mixed air section with minimum outdoor air (two-position), outdoor air (modulating), exhaust air and return air dampers, pre-filter, final filter, glycol heating coil, chilled water cooling coil, supply and relief / exhaust fans with variable frequency drives. The unit is DDC controlled using electric actuation.

B. The air handling unit is scheduled for automatic operation on a scheduled basis.

C. Warm-Up Mode - The supply fans start. The mixing dampers are positioned for 100% return air, the heating coil valve opens and the cooling coil valve remains closed. If time reaches the latest start time during the Warm-Up mode, the outdoor air damper opens to its minimum position. The system is prevented from entering the Warm-Up mode more than once per day.

D. Cool-Down Mode - The supply fans start. The cooling coil valve and the mixing dampers modulate to maintain the supply air temperature set point. When the outdoor air dry bulb temperature is above the economizer changeover value, the mixing dampers position for 100% return air. If time reaches the latest start time during the Cool-Down mode, the outdoor air damper opens to its minimum position or is controlled in economizer operation. The system is prevented from entering the Cool-Down mode more than once per day.

E. When the outside air dry bulb temperature is below the economizer changeover value, the heating section, cooling coil valve and mixing dampers modulate in sequence without overlap to maintain the supply air temperature set point with a low limit of 48 degrees F (9 degrees C) at the mixed air sensor. The mixing dampers ramp open slowly to minimize overshooting.

F. When the outside air dry bulb temperature is above the economizer changeover value, the mixing dampers are placed in the minimum outdoor air position. The heating and cooling coil valves stage in sequence without overlap to maintain the supply air temperature set point.

G. Supply Duct and Building Pressurization Control - The supply fan variable frequency drive modulate to maintain a constant duct static pressure of 1.5 inches of water as sensed at least 2/3 of the distance downstream of the supply fans in either the longest or most critical duct run. The return fan variable frequency drive modulates to maintain the differential CFM set point to maintain a positive building pressure differential. The supply CFM to return CFM differential set point is 0% if the OA damper is closed. Upon shutdown of the air handling system, the supply and return fans variable frequency drives are stopped and the speed signal goes to zero speed.

H. Minimum OA Control - Outside air intake dampers controlled to maintain specified minimum outside air quantity at all times. The unit shall have a minimum OA airflow during occupied hours as listed on the schedule. The OA dampers shall modulate to satisfy the space CO_2 setpoints.

I. Discharge high static and suction low static cutouts on the supply fan, smoke detectors in the supply and return air streams, and supply and relief / exhaust fans VFD fault alarms de-energize the supply and relief / exhaust fans upon activation. When the OAT is less than 45 degrees F (7 degrees C), the heating coil valve modulates to maintain the mixed air temperature at 54 degrees F (7 degrees C). All other dampers and valves position to their normal position after the fans are de-energized.

J. A low temperature detector in the discharge of the heating coil de-energizes the supply fan when temperatures below 38 degrees F (3 degrees C) are sensed. The heating coil valve modulates to maintain the mixed air temperature at 54 degrees F (7 degrees C). All other dampers and valves position to their normal position after the fans are de-energized.

K. Current switches are installed on the load side of the supply and relief / exhaust fans VFDs. The DDC system uses the switches to confirm the fans are in the desired state (i.e. on or off) and generates an alarm if status deviates from DDC start/stop control. The DDC system generates a VFD trouble alarm independent from the fan status.

L. During economizer free cooling operation as the need for additional outside air exceeds the airflow of the associated ERV, the RTU OA damper shall modulate open and relief fan shall energize to maintain space differential pressure. Relief fans associated with air handler shall modulate independently to maintain positive building / space pressure. Coordinate final location of space differential pressure sensors with Contractors.

M. AHU-5 only: Remote switch (to be located in storm shelter away from VFD) shall have the ability to force VFD into bypass mode allowing motor to run at full speed. When in bypass mode, motor shall run at full speed completely independent of building automation system such that damage to BAS components shall not infringe on motor's ability to operate. Switch and wiring shall provide a contact closure to put VFD in bypass mode and shall be furnished and installed by electrical trade.

1.6 CHILLED WATER PUMPS WITH VARIABLE FREQUENCY DRIVES

A. The chilled water system consists of two chilled water pumps with individual variable frequency drives. The system is DDC controlled with electric actuation.

B. Chilled Water Pump Alternation - Chilled water pumps alternate to equalize runtime. Selection of the lead pump is evaluated on a weekly basis. The pump with the least runtime is the lead pump. The pump with the most runtime is the lag pump.

C. Chilled Water Pump Control - The variable frequency drive modulates pump speed to maintain system differential pressure of 20 PSI (adjustable) as sensed near the end of the piping run. If the system differential pressure is below set point and the lead pump is at 100% speed for a time interval of 15 minutes, the lag pump starts. With both pumps on, the variable frequency drives are modulated in unison to maintain system differential pressure. If the system differential is at set point and both pumps are on and at 45% speed for a time interval of 15 minutes the lag pump is stopped.

D. The DDC system uses current switches to confirm the lead pump is in the desired state (i.e. on or off) and generates an alarm if status deviates from DDC start/stop control. If the lead pump goes into alarm, the lag pump starts.

1.7 HOT WATER SYSTEM AND VARIABLE SPEED HOT WATER PUMPS

A. Heating Control - The heating system enable point is controlled either manually by the operator or by a program function (i.e., Time-Of-Day). If the heating system enable point is on, the lead hot water pump starts.

B. The hot water supply set point is reset based on outdoor air temperature. When the outdoor air temperature is 0 degrees F (-18 degrees C), the set point is 180 degrees F (82 degrees C) and when the outdoor air temperature is 60 degrees F (16 degrees C), the set point is 120 degrees F (49 degrees C).

C. Pump Alternation - Pumps alternate to equalize equipment runtime. Selection of the lead and second pump is evaluated on a weekly basis. The pump with the least runtime is the lead. The remaining pump is second. If the lead pump fails, an alarm is generated and the second pump starts.

D. Heating Water Pump Speed Control - The variable frequency drive modulates pump speed to maintain system differential pressure of 20 PSI (adjustable) as sensed near the end of the secondary piping run. If the system differential pressure is below set point and the lead pump is at

100% speed for a time interval of 15 minutes, the lag pump starts. With both pumps on, the variable frequency drives are modulated in unison to maintain system differential pressure. If the system differential is at set point and both pumps are on and at 45% speed for a time interval of 15 minutes the lag pump is stopped.

E. The DDC system uses current switches to confirm the pumps are in the desired state (i.e. on or off) and generates an alarm if status deviates from DDC start/stop control.

1.8 REHEAT COILS - DDC OPERATORS

A. The space served by the reheat coil is controlled in Occupied and Unoccupied modes as follows.

B. Occupied - The controller monitors the room temperature sensor and modulates the reheat valve to maintain the room temperature at set point.

C. Unoccupied - The terminal unit is controlled using the night set point. The controller may reset to the Occupied mode for a predetermined time period upon a signal from the control system or manually at the room sensor.

1.9 MISCELLANEOUS CONTROLS

A. Boiler Controls: Boilers shall come complete with their factory control package. Provide boiler system enable from BAS.

B. AHU Relief / Exhaust Fans: Power Roof Ventilators: Provide scheduled start/stop, fan run status, and speed control signals. Provide VFD's to EC for installation and wiring.

C. Provide monitoring of domestic hot water heating system and provide control of hot water circulating pumps.

D. Provide monitoring and alarm for high level limit for storm and sewage ejector pumps.

1.10 GAS-FIRED UNIT HEATERS

A. Heaters will cycle off thermostat to maintain space temperature. The User shall have the ability to change setpoint and utilize night set back.

1.11 EXHAUST FANS

A. A signal from BAS places fan in occupied mode.

B. Fan runs continuously while in occupied mode.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

DDC INPUT/OUTPUT SUMMARY TABLE

Building: **Satellite Jail**

HARDWARE

Systems	Output Digital: Start/Stop	Output Digital: Enable/Disable	Output Digital: Open/Close	Output Digital: Hand/Off/Auto	Output Digital: Status Light	Output Analog: Control	Output Analog: Manual Override	Input Digital: Status	Input Digital: Status Light	Input Digital: Alarm	Input Analog: Temperature	Input Analog: Pressure	Input Analog: Flow	Input Analog: Humidity	Input Analog: CO^2	Input Analog: Set Point Adjustment
Occupied Time: Scheduled																
AHU's																
Supply Fan VFD		X				X	X	X		X		X				
Relief/Return Fan VFD		X				X	X	X		X						
Freeze stat										X						
Smoke detector (3)										X						
Min OA Dpr.			X													
Return Air											X	X		X	X	X
Mixed Air						X	X				X					X
Heating coil						X	X				X					X
Discharge Air						X	X				X	X		X		X
Tube Heater						X	X				X					
Cooling Coil						X	X				X					X
CHWS/CHWR Temp.											X					
Clg Coil Discharge											X					
Filter Status												X				
Reheats											X					X
Chiller & Pumps	X	X				X	X	X			X					X
Boiler		X									X					
Exhaust Fans	X					X	X	X								
UH						X	X				X					X
Dom HW Recirc Pump	X	X				X	X	X			X					
HWCP																
Outdoor Air											X			X		
Building Pressure												X				

SOFTWARE

Systems	Alarm Digital: Equipment Alarm	Alarm Digital: High Limit	Alarm Digital: Low Limit	Alarm Analog: High Limit	Alarm Analog: Low Limit	Alarm Analog: Run Time
AHU's						
Supply Fan VFD	X	X		X	X	
Relief/Return Fan VFD	X		X			
Freeze stat	X					
Smoke detector (3)	X					
Min OA Dpr.						
Return Air				X	X	
Mixed Air					X	
Heating coil				X	X	
Discharge Air				X	X	
Tube Heater						
Cooling Coil				X		
CHWS/CHWR Temp.						
Clg Coil Discharge						
Filter Status	X					
Reheats		X	X			
Chiller & Pumps	X	X	X			X
Boiler						
Exhaust Fans	X					
UH						
Dom HW Recirc Pump	X					
HWCP						
Outdoor Air						
Building Pressure						

APPLICATION PROGRAMS

Systems	Failure Mode *	Scheduled Start/Stop	Optimal Start/Stop	Duty Cycling	Demand Limiting	Night Setback	Economizer	CFM Control	Cold Deck Reset	Hot Deck Reset	Chilled Water Reset	Hot Water Reset	Cond Water Reset	Chiller Sequencing	Smoke Control	System Integration	Global Data Sharing	Color Graphics	Totalization	Trend	Point History
AHU's	X		X				X				X	X						X	X	X	X
Supply Fan VFD	X																X	X		X	X
Relief/Return Fan VFD																	X	X		X	X
Freeze stat																	X	X		X	X
Smoke detector (3)																	X	X			X
Min OA Dpr.																	X	X			X
Return Air																	X	X		X	X
Mixed Air																	X	X		X	X
Heating coil																	X	X		X	X
Discharge Air																	X	X		X	X
Tube Heater																				X	
Cooling Coil																	X	X		X	X
CHWS/CHWR Temp.																	X	X		X	X
Clg Coil Discharge																	X	X		X	X
Filter Status																	X	X		X	X
Reheats							X										X	X		X	X
Chiller & Pumps											X			X			X	X		X	X
Boiler												X									
Exhaust Fans																	X	X		X	X
UH																	X	X		X	X
Dom HW Recirc Pump						X											X	X		X	X
HWCP																					
Outdoor Air																	X	X		X	X
Building Pressure																					

NOTES: 1. Occupant & BAS adjust | 2. | 3. | 4. | C. Last command | F. Off/Closed | H. High Value | O. On/Open

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SECTION 23 2113

HYDRONIC PIPING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid

1. Contractor:

a. Work includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:

1) Closed water loop piping.
2) Makeup-water piping.
3) Air-vent piping.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 23 2123 - Hydronic Pumps for pumps, motors, and accessories for hydronic piping.

1.3 SUBMITTALS

A. Product Data: For each type of the following:

1. Pressure-seal fittings.
2. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
3. Air control devices.
4. Chemical treatment.
5. Hydronic specialties.

B. Welding certificates.

C. Qualification Data: For Installer.

D. Field quality-control test reports.

E. Aquatherm piping and valves are an acceptable alternative to welded piping being installed in the existing pipe tunnel. The Contractor shall be trained by an Aquatherm Representative. Inspection of the pipe installation shall be checked throughout the installation. The Contractor shall properly insulate all of the Aquatherm pipe and fittings and shall be included in Division 23 0700.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

B. Wrought-Copper Fittings: ASME B16.22.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anvil International, Inc.
b. S. P. Fittings; a division of Star Pipe Products.
c. Victaulic Company of America.

C. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3 "Piping Applications" Article.

C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article.

D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.

E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in Part 3 "Piping Applications" Article.

F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

H. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.3 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

E. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

F. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.4 VALVES

A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 23 Section "Valves."

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Division 23 Section "HVAC Instrumentation and Controls."

C. Bronze, Calibrated-Orifice, Balancing Valves (NPS ½ to NPS 2):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armstrong Pumps, Inc.
b. Bell & Gossett Domestic Pump; a division of ITT Industries.
c. Flow Design Inc.
d. Gerand Engineering Co.
e. Griswold Controls.
f. Taco.
g. Tour and Anderson.

2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves (NPS 2-1/2 and Larger):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Armstrong Pumps, Inc.
    b. Bell & Gossett Domestic Pump; a division of ITT Industries.
    c. Flow Design Inc.
    d. Gerand Engineering Co.
    e. Griswold Controls.
    f. Taco.
    g. Tour & Andersson.

2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig.
11. Maximum Operating Temperature: 250 deg F.

E. Diaphragm-Operated, Pressure-Reducing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Amtrol, Inc.
    b. Armstrong Pumps, Inc.
    c. Bell & Gossett Domestic Pump; a division of ITT Industries.
    d. Conbraco Industries, Inc.
    e. Spence Engineering Company, Inc.
    f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Low inlet-pressure check valve.
8. Inlet Strainer: Removable without system shutdown.
9. Valve Seat and Stem: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

F. Diaphragm-Operated Safety Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Amtrol, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett Domestic Pump; a division of ITT Industries.
   d. Conbraco Industries, Inc.
   e. Spence Engineering Company, Inc.
   f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Wetted, Internal Work Parts: Brass and rubber.
8. Inlet Strainer: Removable without system shutdown.
9. Valve Seat and Stem: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

2.5 AIR CONTROL DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amtrol, Inc.
2. Armstrong Pumps, Inc.
3. Bell & Gossett Domestic Pump; a division of ITT Industries.
4. Taco.

B. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/8.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 225 deg F.

C. Automatic Air Vents:

1. Body: Bronze or cast iron.
2. Internal Parts: Nonferrous.
3. Operator: Noncorrosive metal float.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/4.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 240 deg F.

D. Replaceable Bladder-Type Expansion Tanks:

1. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature. Factory test with taps fabricated and supports installed and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Bladder: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity. Bladder shall be replaceable.
3. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

E. Tangential-Type Air Separators:

1. Tank: Welded steel; ASME constructed and labeled for 125-psig minimum working pressure and 375 deg F maximum operating temperature.
2. Air Collector Tube: Perforated stainless steel, constructed to direct released air into expansion tank or automatic vent.
3. Tangential Inlet and Outlet Connections: Threaded for NPS 2 and smaller; flanged connections for NPS 2-1/2 and larger.
4. Blowdown Connection: Threaded.
5. Size: Match system flow capacity.

2.6 CHEMICAL TREATMENT

A. Bypass Chemical Feeder: Welded steel construction; 125-psig working pressure; 5-gal. capacity; with fill funnel and inlet, outlet, and drain valves.

1. Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.

B. Propylene Glycol: Industrial grade with corrosion inhibitors and environmental-stabilizer additives for mixing with water in systems indicated to contain antifreeze or glycol solutions.

2.7 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

B. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

C. Spherical, Rubber, Flexible Connectors:

1. Body: Fiber-reinforced rubber body.
2. End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.
3. Performance: Capable of misalignment.
4. CWP Rating: 150 psig.

5. Maximum Operating Temperature: 250 deg F.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Closed water system piping, aboveground NPS 2 and smaller, shall be either of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure-seal joints.
2. Schedule 40 steel pipe; Class 125, cast-iron fittings and threaded joints.

B. Closed water system piping, aboveground, NPS 2-1/2 and larger, shall be the following:

1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

C. Makeup-water piping installed aboveground shall be the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

D. Makeup-Water Piping Installed Belowground and within Slabs: Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.

E. Condensate-Drain Piping: Type L (B) DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints or Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.

F. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.

G. Air-Vent Piping:

1. Inlet: Same as service where installed.
2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

H. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.

3.2 DRAIN LINES

A. Contractor shall provide and install a complete drain system from all coil drain pans in all air handling units, fan coils, evaporator coils and cooling coils. On double sloped pans and / or pans with two drain connections provide drains on both sides.

1. Where multiple, stacked cooling coils are used each coil shall have its own (stainless steel) drain pan. Provide internal drop tubes from each such pan down to the main drain pan.
2. Provide individual draining with P-trap for each drain pan.

B. All drains shall be trapped. Traps shall be designed to withstand the maximum (positive or negative) pressures imposed on them by service without ponding or retaining water in the pans.

1. Dimension from bottom of pan outlet to trap invert shall be equal to two times unit static pressure (in inches of water) plus unit velocity head (in inches of water).

2. Dimension from bottom of trap to trap outlet shall be equal to two times unit static pressure (in inches of water).

C. Drain lines shall be the same size as the pan outlet connections.

D. All drain lines shall slope uniformly to termination point at slope of 1/8" per foot.

E. Terminate drain lines at floor drains with indirect connection.

3.3 VALVE APPLICATIONS

A. Install shutoff-duty valves where shown on plans, and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; and pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

G. Well-field vault enclosure may be constructed as detailed on the drawings or Atlantis Vault constructed of CPChem Performance Driscoplex 5300 Climate Guard High Density Polyethylene is also acceptable. For either vault the manhole lid shall be connected with 8-3/8" stainless steel counter sunk bolts and the lid shall have a 5000 pound load bearing capacity.

3.4 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Arrange all piping to drain by gravity. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

N. Install branch connections to mains using mechanically formed tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

O. Install valves according to Division 23 Section "Valves."

P. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

Q. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

R. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

S. Identify piping as specified in Division 23 Section "Mechanical Identification."

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports." Comply with the following requirements for maximum spacing of supports.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 7 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.
7. NPS 4: Maximum span, 14 feet; minimum rod size, ½ inch.
8. NPS 6: Maximum span, 17 feet; minimum rod size, ½ inch.

9. NPS 8: Maximum span, 19 feet; minimum rod size, 5/8 inch.
10. NPS 10: Maximum span, 20 feet; minimum rod size, 3/4 inch.
11. NPS 12: Maximum span, 23 feet; minimum rod size, 7/8 inch.
12. NPS 14: Maximum span, 25 feet; minimum rod size, 1 inch.
13. NPS 16: Maximum span, 27 feet; minimum rod size, 1 inch.
14. NPS 18: Maximum span, 28 feet; minimum rod size, 1-1/4 inches.
15. NPS 20: Maximum span, 30 feet; minimum rod size, 1-1/4 inches.

D. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
6. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.

3.6 PIPE JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.7 HYDRONIC SPECIALTIES INSTALLATION

A. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Manual vents at heat-transfer coils and elsewhere as required for air venting.

B. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 and larger.

C. Install bypass chemical feeders in each hydronic system where indicated, in upright position with top of funnel not more than 48 inches above the floor. Install feeder in minimum NPS 3/4 bypass line, from main with full-size, full-port, ball valve in the main between bypass connections. Install NPS 3/4 pipe from chemical feeder drain, to nearest equipment drain and include a full-size, full-port, ball valve.

D. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure tank is properly charged with air to suit system Project requirements.

3.8 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Division 23 Section "Meters and Gages."

3.9 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.
7. Compressed air testing on hydronic piping is not acceptable.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION

SECTION 23 2113.33

GROUND-LOOP HEAT-PUMP PIPING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid

1. Contractor:

a. All work related to furnishing, installing, and testing of the following material described within this specification as outlined in the HVAC drawings:

1) Piping for vertical, direct-buried, ground-loop, heat-pump systems that operate between 23 and 104 deg F.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Ground-Loop, Heat-Pump Piping: 160 psig.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Pipe and fittings.
2. Joining method and equipment.
3. Propylene glycol solution.

B. Field quality-control test reports.

1.4 PERMITS

A. Before commencement of any works, the Contractor shall be responsible for checking compliance with local and state regulations, and obtaining any permits relating to the geothermal system, both for installation and use.

1.5 TEST WELL REPORT

A. Will be provided.

PART 2 - PRODUCTS

2.1 PIPES AND FITTINGS

A. PE Pipe: ASTM D 3035, SDR Numbers 7, 9 or 11 with PE compound number required to achieve required system working pressure.

1. Molded PE Fittings: ASTM D 2683 or ASTM D 3261, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.

B. U-Bend Assembly: Factory fabricated with embossed depth stamp every 24 inches from U-bend.

2.2 BOREHOLE BACKFILL

A. General: Thermally-enhanced bentonite grout shall be used to seal and backfill each vertical u-bend well bore of the closed-loop heat exchanger to insure proper thermal contact with the earth and to ensure the environmental integrity of each vertical bore column. The grouting material shall remain in a plastic state (moldable) throughout the life of the system and shall not generate heat during the hydration process. No other backfill material shall be accepted.

B. Submittals: Manufacturer's published product submittal information sheets which shall include mixing instructions, minimum thermal conductivity performance, permeability, percent solids, grout weight, linear shrinkage potential and unit yield along with verification of the required listing(s). Grouting compound (bentonite-based additive) shall be certified and listed by NSF (National Sanitation Foundation International) to ANSI/NSF Standard 60, "Drinking Water Treatment Chemicals - Health Effects".

C. Product: Grouting material shall be one of Black Hills Bentonite's Thermal Grout products as supplied by GeoPro, Inc. or pre-approved equivalent. The thermal enhancement compound (high-grade silica sand) shall also be specified and supplied by the developer and supplier of the bentonite base material.

D. Thermal Conductivity: The thermal conductivity of the grouting compound must be 1.0 Btu/hr-ft-°F or greater as determined when tested in accordance to ASTM D-5334, "Standard Test Method for Determination of Thermal Conductivity of Soils and Soft Rock by Thermal Needle Probe Procedure" per International Ground Source Heat Pump Association (IGSHPA) Standard 2B.1.2.1. The reported thermal conductivity value shall be verified by an independent company which has a minimum of 5 years experience in measuring thermal conductivity using this method. A copy of the verification report shall be supplied upon request from the Engineer.

E. Permeability: The grout mixture shall also have a maximum permeability rate of less than 8.0 x 10-8 cm/s as determined by using ASTM D-5084, "Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeability, Method C - test with increasing tailwater level", per IGSHPA Standard 2B.1.2.2, with a 5 psi confinement pressure (to simulate an approximate sample depth of 5 foot). The reported permeability shall be verified by an independent, lab which has been certified by AMRL (American Association of State Highway & Transportation Officials, Materials Reference Laboratory) and valid by the US Army Corps of Engineers to perform ASTM D-5084 at the time of verification as found on the Internet at "http://www.west.army.mil/SL/MTC/ValidatedLabsList.htm" per IGSHPA Standard 2B.1.2.3. A copy of the report shall be supplied upon request from the Engineer. Credentials of the independent laboratory shall also be supplied upon request from the Engineer.

F. The thermally enhanced bentonite grout used shall have a minimum manufacturer's recommended mixture of 71% solids. The thermal enhancement compound (high-grade silica compound) shall

constitute a minimum of 63% by weight of the total aqueous slurry. The installed grouting material shall be fully set into a putty consistency within a minimum of 4 hours after being pressure pumped in the vertical bore annulus.

2.3 ANTIFREEZE SOLUTION

A. Propylene Glycol: Minimum 99 percent propylene glycol with corrosion inhibitors and environmental stabilizer additives to be mixed with water to protect the piping circuit and connected equipment from physical damage from freezing or corrosion.

B. Quantity: Sufficient solution for initial system startup and for preventive maintenance for one year from date of Substantial Completion.

C. Dilution Water: Chloride content shall be less than 25 ppm, sulfate less than 25 ppm, and hardness less than 100 ppm.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, warning tape, and backfilling are specified in Section 312000 "Earth Moving."

B. A preliminary test drill and formation thermal conductivity test has been performed on the site, the results of which are available for Contractor review. This bore hole will be reused within the final geothermal scheme.

C. Drilling

1. Borehole diameter shall be minimized to reduce drilling costs and reduce mud flow. Target diameter 4.5 inches. Maximum acceptable diameter 6 inches.
2. Review in-situ test loop results, record grout flow rate, volume injected and pressure.
3. Make sure hydrostatic pressure was calculated for loop filled with water and for weight of grout used.
4. Check loop length numbers stenciled on pipe.
5. Check pipe specification numbers on pipe prior to installation and record.
6. Drilling fluid shall contain a bentonite viscosifier such as baroid quick-gel to stabilize bore hole wall. Mix per manufacturer's recommendations. Minimum concentration at 15 pounds per 100 gallons of water.

3.2 VERTICAL PIPING INSTALLATION

A. Install PE piping in boreholes according to ASTM D 2774 or ASTM F 645.

1. Clean PE pipe and fittings and make heat-fusion joints according to ASTM D 2657. Minimize number of joints.

B. Purge, flush, and pressure test piping before backfilling boreholes.

C. After installation of loop pipe in borehole, fill piping loop with water or antifreeze solution, and pump backfill into borehole to discharge at base of borehole.

D. Fill bore hole with backfill grout mixture from the bottom of the bore hole to a point at least 60 inches below grade. Backfill remainder of bore in accordance with Section 31 2000.

E. Extend piping and connect to water-source, ground-loop, heat-pump piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building water-source, ground-loop, heat-pump piping systems are installed. Terminate piping with caps. Make connections to building water-source, ground-loop, heat-pump piping systems when those systems are installed.

F. Wall sleeves are specified in Division 23 Section "Common Work Results for HVAC."

G. Mechanical sleeve seals are specified in Division 23 Section "Common Work Results for Plumbing."

3.3 ANTIFREEZE SOLUTION FILL

A. Fill system with required quantity of propylene glycol and water to provide minus 10 deg F freeze protection.

B. Test the dilute solution using gas chromatography to verity concentration of propylene glycol, and forward report to Architect.

3.4 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

3.5 GROUTING

A. Installation: Thermally enhanced bentonite grouting material shall be mixed according to manufacturer's written instructions. Grout material shall be pressure pumped through a one (1) inch, one and one-quarter (1-1/4) inch or a one and one-half (1-1/2) inch inside diameter tremie pipe and placed in the bore column from the bottom to the top. The tremie pipe shall be temporarily fastened to and inserted with the U-bend pipe loop. Inserting the tremie pipe after the U-bend pipe loop has been installed in the borehole is not acceptable. Diving rods are acceptable to hold loop piping in place for grouting of the borehole. Grouting process shall conform to the manufacturer's instructions and "Grouting for Vertical Geothermal Heat Pump Systems - Engineering Design and Field Procedures Manual", as published by the IGSHPA, Oklahoma State University (OSU), 2000. Completed grouted surface shall be placed at ground level to ensure complete fill of the bore column.

B. Grout bore hole the same day it is bored.

3.6 FIELD QUALITY CONTROL

A. Piping Tests: Fill piping 24 hours before testing and apply test pressure to stabilize piping. Use potable water only.

B. Hydrostatic Tests: Test at not less than 1-1/2 times the pipe working-pressure rating allowing for static pressure of borehole depth.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 30 minutes. Slowly increase to next test pressure increment and hold for 30 minutes. After testing at maximum test pressure, reduce pressure to 30 psig. Hold for 90 minutes, and measure pressure at 30-minute intervals. Repair leaks and retest until no leaks exist.

C. Prepare reports of testing activity. Reports to include for a minimum of the following:

1. Driller's logs to depth in local area.
2. Site layout of loop header installation locations.
3. Size and lengths of loops and headers with loop pipe length numbers on pipes.
4. Pipe specifications and record of those shown on pipe.
5. Size and length of grout injection pipe.
6. Estimate of extent of caving in hole, barrels of cuttings.
7. Record grout specification and supplier mixing recommendations.
8. Record mixing procedure, ratios and volumes.
9. Record water test results for pH and calcium content.
10. Record grout test results for viscosity and weight.
11. Record problems and solutions.

D. Grouting Inspection: Since some settling may occur after initial placement of the grout material, the Contractor shall monitor each borehole and continue adding grout as required for a period of no less than thirty (30) minutes and no longer than two (2) hours. Since there usually is a direct correlation between thermal conductivity and permeability, only thermal conductivity shall be inspected. The grouting manufacturer shall provide testing of site mixed grouting material in accordance to ASTM D-5334 to verify thermal conductivity. Manufacturer shall provide a minimum of three, sample analysis for this project. At a minimum, sampling shall be taken once at the beginning of the project, once at approximately one-third of completion and finally at approximately two-third of completion. In the event that the analysis indicates a thermal conductivity value below the minimum specified value, corrective action shall be taken to increase thermal conductivity value back to minimum specified requirement. A written report will be submitted defining corrective action taken.

END OF SECTION

SECTION 23 2123

HYDRONIC PUMPS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid

1. Contractor

a. All work related to furnishing, installing, and testing of the following material described within this specification as outlined in the HVAC drawings:

1) Separately coupled, base-mounted, end-suction centrifugal pumps

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 DEFINITIONS

A. Buna-N: Nitrile rubber.

B. EPT: Ethylene propylene terpolymer.

1.3 SUBMITTALS

A. Product Data: Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.

B. Shop Drawings: Show pump layout and connections. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hydronic pumps through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

B. Store pumps in dry location.

C. Retain protective covers for flanges and protective coatings during storage.

D. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

E. Comply with pump manufacturer's written rigging instructions.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 SEPARATELY COUPLED, BASE-MOUNTED, END-SUCTION CENTRIFUGAL PUMPS

A. Manufacturers:

1. Armstrong.
2. Aurora.
3. Bell & Gossett; Div. of ITT Industries.
4. Taco.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for base mounting, with pump and motor shafts horizontal. Rate pump for 125-psig minimum working pressure and a continuous water temperature of 225 deg F.

C. Pump Construction:

1. Casing: Radially split, cast iron, with replaceable bronze wear rings, threaded gage tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and flanged connections. Provide integral mount on volute to support the casing, and attached piping to allow removal and replacement of impeller without disconnecting piping or requiring the realignment of pump and motor shaft.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. Trim impeller to match specified performance.
3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and Buna-N bellows and gasket.
5. Pump Bearings: Grease-lubricated ball bearings contained in cast-iron housing with grease fittings.

D. Shaft Coupling: Molded rubber insert and interlocking spider capable of absorbing vibration. Couplings shall be drop-out type to allow disassembly and removal without removing pump shaft or motor.

E. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.

F. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels and angles. Fabricate to mount pump casing, coupling guard, and motor.

G. Motor: Single speed, with permanently lubricated or grease-lubricated ball bearings, unless otherwise indicated; secured to mounting frame, with adjustable alignment. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

2.2 PUMP SPECIALTY FITTINGS

A. Suction Diffuser: Angle pattern, 175-psig pressure rating, cast -iron body and end cap, pump-inlet fitting; with bronze startup and bronze or stainless-steel permanent strainers; bronze or stainless-steel straightening vanes; drain plug; and factory-fabricated support.

B. Triple-Duty Valve: Angle or straight pattern, 175-psig pressure rating, cast-iron body, pump-discharge fitting; with drain plug and bronze-fitted shutoff, balancing, and check valve features. Brass gage ports with integral check valve, and orifice for flow measurement.

2.3 VFD DRIVE FOR PUMPS - GEOTHERMAL SYSTEM, FIELD AND HOT WATER SYSTEM PUMPS

A. Provide ABB-ACH550 VFD or equivalent. VFD shall be provided by Contractor.

B. VFD shall be BACnet MS/TP or IP compatible and shall be controlled to maintain a set system differential pressure. Geothermal field pumps shall be controlled to maintain a set supply temperature range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

3.2 CONCRETE BASES

A. Install concrete bases of dimensions indicated for pumps and controllers. Refer to Division 23 Section "Common Work Results for HVAC."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.

2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.3 PUMP INSTALLATION

A. Comply with HI 1.4 or HI 2.4 as appropriate.

B. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Set base-mounted pumps on concrete foundation. Disconnect coupling before setting. Do not reconnect couplings until alignment procedure is complete.

1. Support pump baseplate on rectangular metal blocks and shims, or on metal wedges with small taper, at points near foundation bolts to provide a gap of 3/4 to 1-1/2 inches between pump base and foundation for grouting.
2. Adjust metal supports or wedges until pump and driver shafts are level. Check coupling faces and suction and discharge flanges of pump to verify that they are level and plumb.

3.4 ALIGNMENT

A. Align pump and motor shafts and piping connections after setting on foundation, grout has been set and foundation bolts have been tightened, and piping connections have been made.

B. Comply with pump and coupling manufacturers' written instructions.

C. Adjust pump and motor shafts for angular and offset alignment by methods specified in HI 1.1-1.5, "Centrifugal Pumps for Nomenclature, Definitions, Application and Operation or HI 2.1-2.5, "Vertical Pumps for Nomenclature, Definitions, Application and Operation."

3.5 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

E. Install triple-duty valve on discharge side of pumps.

F. Install suction diffuser and shutoff valve on suction side of pumps.

G. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.

H. Install pressure gages on pump suction and discharge, at integral pressure-gage tapping, or install single gage with multiple input selector valve.

I. Install electrical connections for power, controls, and devices.

J. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

K. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

END OF SECTION

SECTION 23 2500

HVAC WATER TREATMENT

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid

1. Contractor

a. All work related to furnishing, installing, and testing of the following material described within this specification as outlined in the HVAC drawings:

1) Chemical treatment test equipment.
2) HVAC water-treatment chemicals.

B. Alternate Bids:

1. Contractor:

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 DEFINITIONS

A. EEPROM: Electrically erasable, programmable read-only memory.

B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

C. TDS: Total dissolved solids.

1.3 PERFORMANCE REQUIREMENTS

A. Water quality for HVAC systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of HVAC equipment without creating a hazard to operating personnel or the environment.

B. Base HVAC water treatment on quality of water available at Project site, HVAC system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.

C. Closed hydronic systems, including ~~(2)~~ glycol hot water and chilled water loop systems, shall have the following water qualities:

1. Propylene Glycol

a. This product shall be an industrially inhibited ~~ethylene~~ ***propylene*** glycol based antifreeze solution to provide freeze and corrosion protection in HVAC systems such as chilled water and hot water heating systems. The product shall not make use of any silicate containing corrosion inhibitors and should not be formulated to provide

corrosion protection for aluminum or galvanized metals. The product shall be formulated to provide corrosion protection for the common metals of construction in HVAC systems such as steel, copper, brass, bronze, solders, etc. Corrosion rates on these metals as determined under ASTM D1384 shall not exceed 0.5 mils penetration per year.

Composition	% By Weight
~~Ethylene~~ ***Propylene*** Glycol (Total Glycols)	92.5%
Dye, Inhibitors and Water	7.5%

Specific Gravity 60/60 F	1.133-1.140
Reserve Alkalinity (ASTM D1121)	Minimum 20 ml
Sulfates and Chlorides Total	50 ppm
pH (50% Solution)	8.5-9.0

b. The product shall contain a small percentage of an effective antifoam compound, (such as Dow Corning Antifoam A) to prevent the formation of foam.
c. The product shall be furnished in 55 gallon steel drums which are in good condition and shall be fitted with standard bung plugs and seals to prevent contamination of product.

2. Solutions shall be 30% ~~ethylene~~ ***propylene*** glycol by weight, ~~14%~~ ***28%*** ~~ethylene~~ ***propylene*** glycol by volume. Galvanized steel and / or aluminum shall not be used in contact with glycol solutions.
3. Provide fractional horsepower self-priming transfer pump to allow filling of glycol systems. Pump shall be 120 VAC, cord and plug connected with hose end fittings. Provide 15' length of 3/4" flexible hose with hose end fittings to match hose bibb threads and pump fittings. Turn pump and hose over to Owner upon project completion and obtain receipt.
4. Water used in ethylene glycol systems shall be potable, free of foreign materials, and shall have low (below 50 ppm) levels of chloride, sulfate and hard water ions.
5. Procedure to introduce ~~ethylene~~ ***propylene*** glycol to systems:

   a. Sample the local potable water supply. If levels of chloride, sulfate or hard water hardness exceed 50 ppm, then provide acceptable water from off-site and notify the Architect / Engineer in writing so arrangements can be made by the Owner for a water-softening service.
   b. Calculate the amount of ~~ethylene~~ ***propylene*** glycol required based on system volume.
   c. Pressure test system. Repair all leaks.
   d. Drain enough water from system to provide space for ~~ethylene~~ ***propylene*** glycol.
   e. Add the correct amount of inhibited ~~ethylene~~ ***propylene*** glycol solution and water.
   f. Circulate solution for at least 24 hours to ensure complete mixing. Withdraw one sample per system and forward sample to ~~ethylene~~ ***propylene*** glycol manufacturer for analyses. Analyses shall include concentration, freeze point, pH, reserve alkalinity and appearance. Submit in a report the degradation products, scale promoters, contaminants, corrosives and inhibitors. Forward copies of potable water and of glycol analyses to Architect / Engineer.

6. Stencil test dates on expansion tanks below system volume figures.
7. Glycol systems shall be separated from potable water systems by air gaps or by code-approved backflow preventers.
8. Acceptable Manufacturers

   a. Arco Chemical - Chill Safe
   b. Dow Chemical Dowtherm 4000
   c. DuPont or Interstate Intercool OP-100-RA-25 (800-322-6145)
   d. Union Carbide UCAR Food Freeze
   e. Rhomar Water.

9. Forward shop drawing submittals to Architect / Engineer for review. Automotive anti-freeze is not acceptable.

D. Passivation for Galvanized Steel: For the first 60 days of operation.

1. pH: Maintain a value within 7 to 8.
2. Calcium Carbonate Hardness: Maintain a value within 100 to 300 ppm.
3. Calcium Carbonate Alkalinity: Maintain a value within 100 to 300 ppm.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for the following products:

1. Chemical solution tanks.
2. Chemical test equipment.
3. Chemical material safety data sheets.

B. Shop Drawings: Pretreatment and chemical treatment equipment showing tanks, maintenance space required, and piping connections to HVAC systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: Power and control wiring.

C. Field quality-control test reports.

D. Other Informational Submittals:

1. Water-Treatment Program: Written sequence of operation on an annual basis for the application equipment required to achieve water quality defined in the "Performance Requirements" Article above.
2. Water Analysis: Illustrate water quality available at Project site.
3. Passivation Confirmation Report: Verify passivation of galvanized-steel surfaces, and confirm this observation in a letter to Architect.

1.5 QUALITY ASSURANCE

A. HVAC Water-Treatment Service Provider Qualifications: An experienced HVAC water-treatment service provider capable of analyzing water qualities, installing water-treatment equipment, and applying water treatment as specified in this Section.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 MAINTENANCE SERVICE

A. Scope of Maintenance Service: Provide chemicals and service program to maintain water conditions required above to inhibit corrosion, scale formation, and biological growth for geothermal ground loop system and equipment. Services and chemicals shall be provided for a period of one year from date of Substantial Completion, and shall include the following:

1. Initial water analysis and HVAC water-treatment recommendations.
2. Startup assistance for Contractor to flush the systems, clean with detergents, and initially fill systems with required chemical treatment prior to operation.

3. Periodic field service and consultation.
4. Customer report charts and log sheets.
5. Laboratory technical analysis.
6. Analyses and reports of all chemical items concerning safety and compliance with government regulations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ampion Corp.
2. Anderson Chemical Co, Inc.
3. Aqua-Chem, Inc.; Cleaver-Brooks Div.
4. Barclay Chemical Co.; Water Management, Inc.
5. Boland Trane Services
6. GE Betz.
7. GE Osmonics.
8. H-O-H Chemicals, Inc.
9. Metro Group. Inc. (The); Metropolitan Refining Div.
10. ONDEO Nalco Company.
11. Watcon, Inc.

2.2 STAINLESS-STEEL PIPES AND FITTINGS

A. Stainless-Steel Tubing: Comply with ASTM A 269, Type 316.

B. Stainless-Steel Fittings: Complying with ASTM A 815/A 815M, Type 316, Grade WP-S.

C. Two-Piece, Full-Port, Stainless-Steel Ball Valves: ASTM A 351, Type 316 stainless-steel body; ASTM A 276, Type 316 stainless-steel stem and vented ball, carbon-filled TFE seats, threaded body design with adjustable stem packing, threaded ends, and 250-psig SWP and 600-psig CWP ratings.

D. Three-Piece, Full-Port, Stainless-Steel Ball Valves: ASTM A 351, Type 316 stainless-steel body; ASTM A 276, Type 316 stainless-steel stem and vented ball, threaded body design with adjustable stem packing, threaded ends, and 150-psig SWP and 600-psig CWP rating.

2.3 CHEMICAL TREATMENT TEST EQUIPMENT

A. Test Kit: Manufacturer-recommended equipment and chemicals in a wall-mounting cabinet for testing pH, TDS, inhibitor, chloride, alkalinity, and hardness; sulfite and testable polymer tests for high-pressure boilers, and oxidizing biocide test for open cooling systems.

B. Sample Cooler:

1. Tube: Sample.

a. Size: NPS 1/4 tubing.
b. Material: ASTM A 666, Type 316 stainless steel.
c. Pressure Rating: Minimum 2000 psig.

d. Temperature Rating: Minimum 850 deg F.

2. Shell: Cooling water.

a. Material: ASTM A 666, Type 304 stainless steel.
b. Pressure Rating: Minimum 250 psig.
c. Temperature Rating: Minimum 450 deg F.

3. Capacities and Characteristics:

a. Tube: Sample.

1) Flow Rate: 0.25 gpm.
2) Entering Temperature: 400 deg F.
3) Leaving Temperature: 88 deg F.
4) Pressure Loss: 6.5 psig.

b. Shell: Cooling water.

1) Flow Rate: 3 gpm.
2) Entering Temperature: 70 deg F.
3) Pressure Loss: 1.0 psig.

C. Corrosion Test-Coupon Assembly: Constructed of corrosive-resistant material, complete with piping, valves, and mild steel and copper coupons. Locate copper coupon downstream from mild steel coupon in the test-coupon assembly.

1. Two-station rack for closed-loop systems.

2.4 CHEMICALS

A. Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment, and that can attain water quality specified in Part 1 "Performance Requirements" Article.

B. Water Softener Chemicals:

1. Mineral: High-capacity, sulfonated-polystyrene ion-exchange resin that is stable over entire pH range with good resistance to bead fracture from attrition or shock. Resin exchange capacity minimum 30,000 grains/cu. ft. of calcium carbonate of resin when regenerated with 15 lb of salt.
2. Salt for Brine Tanks: High-purity sodium chloride, free of dirt and foreign material. Rock and granulated forms are not acceptable.

PART 3 - EXECUTION

3.1 WATER ANALYSIS

A. Perform an analysis of supply water to determine quality of water available at Project site.

3.2 INSTALLATION

A. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.

B. Install water testing equipment on wall near water chemical application equipment.

C. Install interconnecting control wiring for chemical treatment controls and sensors.

D. Mount sensors and injectors in piping circuits.

E. Bypass Feeders: Install in closed hydronic systems, including geothermal ground loop system and equipped with the following:

1. Install bypass feeder in a bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
2. Install water meter in makeup water supply.
3. Install test-coupon assembly in bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
4. Install a gate or full-port ball isolation valves on inlet, outlet, and drain below feeder inlet.
5. Install a swing check on inlet after the isolation valve.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings. Dielectric fittings are specified in Division 23 Section "Common Work Results for HVAC."

D. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Division 23 Section "General-Duty Valves for HVAC Piping."

E. Refer to Division 22 Section "Domestic Water Piping Specialties" for backflow preventers required in makeup water connections to potable-water systems.

F. Confirm applicable electrical requirements in Division 26 Sections for connecting electrical equipment.

G. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

H. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Inspect field-assembled components and equipment installation, including piping and electrical connections.
2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of HVAC systems' startup procedures.
4. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.
5. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
6. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
7. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.
8. Repair leaks and defects with new materials and retest piping until no leaks exist.

D. Remove and replace malfunctioning units and retest as specified above.

E. Sample boiler water at one-week intervals after boiler startup for a period of five weeks, and prepare test report advising Owner of changes necessary to adhere to Part 1 "Performance Requirements" Article for each required characteristic. Sample boiler water at eight-week intervals following the testing noted above to show that automatic chemical-feed systems are maintaining water quality within performance requirements specified in this Section.

F. At eight-week intervals following Substantial Completion, perform separate water analyses on hydronic systems to show that automatic chemical-feed systems are maintaining water quality within performance requirements specified in this Section. Submit written reports of water analysis advising Owner of changes necessary to adhere to Part 1 "Performance Requirements" Article.

G. Comply with ASTM D 3370 and with the following standards:

1. Silica: ASTM D 859.
2. Steam System: ASTM D 1066.
3. Acidity and Alkalinity: ASTM D 1067.
4. Iron: ASTM D 1068.
5. Water Hardness: ASTM D 1126.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain HVAC water-treatment systems and equipment. Refer to Division 01 Section "Demonstration and Training."

B. Training: Provide a "how-to-use" self-contained breathing apparatus video that details exact operating procedures of equipment.

END OF SECTION

SECTION 23 3113

METAL DUCTS

PART 1 - GENERAL

1.1 Base Bid:

1. Contractor

    a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the HVAC drawings:

        1) Single-wall rectangular ducts and fittings.
        2) Double-wall round ducts and fittings.
        3) Sheet metal materials.
        4) Duct liner.
        5) Sealants and gaskets.
        6) Hangers and supports.
        7) Louvers.
        8) Single-wall round ducts and fittings.

B. Alternate Bids:

1. Contractor

    a. Alternate Bid No. 1: Does not apply.
    b. Alternate Bid No. 2

        1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the HVAC drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC for testing, adjusting, and balancing requirements for metal ducts.
2. Section 23 3300 - Air Duct Accessories for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 DOUBLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Lindab Inc.
2. McGill AirFlow LLC.
3. SEMCO Incorporated.
4. Sheet Metal Connectors, Inc.
5. Lapine Metal Products

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.

C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.

1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

    a. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

    a. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
    b. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch- diameter perforations, with overall open area of 23 percent.

E. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Cover insulation with polyester film complying with UL 181, Class 1.

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation; Insulation Group.
b. Johns Manville.
c. Knauf Insulation.
d. Owens Corning.

2. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).

7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
10. VOC: Maximum 395 g/L.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

2.7 LOUVERS

A. Provide and install extruded aluminum louvers in walls as shown on drawings and as specified herein.

B. Intake louvers shall be 4" deep double hook design arranged to permit bottom of duct to hook over bottom blade for drainage to outside.

C. Louvers in other walls shall have wall flange on sides, top and bottom.

D. All louvers shall be constructed of minimum .081 extrusions, with reinforcing bosses and bars as required.

E. Furnish 5/8" mesh removable bird screens on inside of all louvers, constructed of .063 wire with extruded frames.

F. Louvers shall have color anodized finish. Final louver finish shall be selected by Architect/Engineer at shop drawing review stage. Submit color samples with shop drawings.

G. All louvers shall have AMCA rating and label. The manufacturer shall furnish air pressure loss and water penetration data with all submittals.

H. Acceptable manufacturers: Air Balance Inc., Chicago, Illinois; The Airolite Co., Marietta, Ohio; American Warming and Vent Co., Inc., Toledo, Ohio; Arrow United, Long Island City, New York; and Vent Products Co., Inc., Chicago, Illinois. Ruskin.

I. Provide insulated panels to blank off unused portion(s) of louvers not used for ducted connections:

1. Panels shall be insulated with 1" thick rigid closed cell foam enclosed in 22 gage (minimum) sheet metal.
2. Prime panels with rust-resistant paint, color selected by Architect.
3. Panels shall be anodized aluminum in color to match louver.

J. Forward shop drawing submittals to the Architect/Engineer for review.

2.8 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards".

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Lindab Inc.
b. McGill AirFlow LLC.
c. SEMCO Incorporated.
d. Sheet Metal Connectors, Inc.
e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards", "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards", "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards", "90 Degree Tees and Laterals", "Conical Tees", for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. All ducts shall be of size indicated on the drawings. In no case shall the indicated duct size be changed without written approval of the Architect / Engineer.

C. Duct sizes shown on drawings are met inside area. Where duct lining is specified, increase duct sizes to allow for lining.

D. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

E. Install round and flat-oval ducts in maximum practical lengths.

F. Install ducts with fewest possible joints.

G. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

H. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

I. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

J. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

K. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

L. Where ducts pass through non-fire rated interior partitions, seal around duct with non-combustible material.

M. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

N. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

O. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

F. Support all horizontal ducts up to 46" wide with field punched steel strap hangers, sized per SMACNA, placed down side, turned under bottom of ducts and securely fastened to the building construction in an approved manner. Ducts from 47" up to 70" wide shall have 1.50" x 1.50" x 3/16" angle iron trapeze hangers with 3/8" diameter rods attached to building construction. Ducts from 71" up to 118" wide shall have 2.50" x 2" x 5/16" angle iron trapeze hangers with ½" diameter rods attached to building construction. Space horizontal duct supports not more than 8'-0" apart. All hangers and stiffeners shall be galvanized steel.

G. No piping, conduit, ceiling supports or any other building element shall be suspended from duct supports.

H. Carefully check the arrangement of ducts and dimensions of all working spaces at the building so that there will be no interference with the running of ducts. Carefully lay out all openings in floors and walls.

I. Increase duct sizes gradually, not exceeding 15 divergence or convergence in duct runs.

J. Where plenum-type takeoffs or runouts are shown and at all flex duct connections to rectangular ducts, the area of opening into main duct shall be a minimum of 150% of branch duct area.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes2-Inch wg and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.7 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.8 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive 2-inch wg.

b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Constant-Volume Air-Handling Units:

a. Pressure Class: Positive 3-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

B. Return Ducts:

1. Ducts Connected to Fan Coil Units, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 2-inch wg.
b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

2. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.

a. Exposed to View: Type 304, 14 gauge, stainless-steel sheet, No. 4 finish.
b. Concealed: Type 304, stainless-steel sheet, No. 2D finish or 14 gauge carbon steel sheet.
c. Welded seams and joints.
d. Pressure Class: Positive or negative 3-inch wg.
e. SMACNA Leakage Class: 3.

D. Liner:

1. Return Air Ducts (Where Shown on the Drawings): Fibrous glass, Type I, 1 inch thick.
2. Exhaust / Relief Ducts (Where Shown on the Drawings): Fibrous glass, Type I, 1 inch thick.

E. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam or welded.

F. Exposed Ductwork in Finished Areas:

1. Exposed round ductwork to be double wall insulated.
2. Exposed rectangular ductwork to be board insulated and paintable.

END OF SECTION

SECTION 23 3300

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 Base Bid:

1. Contractor

    a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the HVAC drawings:

        1) Backdraft and pressure relief dampers.
        2) Manual volume dampers.
        3) Control dampers.
        4) Fire dampers.
        5) Flange connectors.
        6) Turning vanes.
        7) Duct-mounted access doors.
        8) Flexible connectors.
        9) Flexible ducts.
        10) Duct accessory hardware.

B. Alternate Bids:

1. Contractor

    a. Alternate Bid No. 1: Does not apply.
    b. Alternate Bid No. 2

        1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the HVAC drawings.

1.2 RELATED WORK

A. Related Sections:

1. Section 23 3423 - HVAC Gravity Ventilators for roof-mounted ventilator caps.
2. Section 28 4621.11 - Fire Detection and Alarm for duct-mounted fire and smoke detectors.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

    a. Special fittings.
    b. Manual volume damper installations.
    c. Control damper installations.
    d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
    e. Duct security bars.
    f. Wiring Diagrams: For power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

D. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

1.5 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. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

    1. Galvanized Coating Designation: G60.
    2. Exposed-Surface Finish: Mill phosphatized.

C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and No. 4 finish for exposed ducts.

D. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. American Warming and Ventilating; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Duro Dyne Inc.
5. Greenheck Fan Corporation.
6. Lloyd Industries, Inc.
7. Nailor Industries Inc.
8. NCA Manufacturing, Inc.
9. Pottorff; a division of PCI Industries, Inc.
10. Ruskin Company.
11. SEMCO Incorporated.
12. Vent Products Company, Inc.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm.

D. Maximum System Pressure: 1-inch wg.

E. Frame: galvanized sheet steel or extruded aluminum with welded corners.

F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch width, roll-formed aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Extruded vinyl, mechanically locked or neoprene, mechanically locked.

I. Return Spring: Adjustable tension.

J. Bearings: Steel ball or synthetic pivot bushings.

K. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Bird screen.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Air Balance Inc.; a division of Mestek, Inc.
    b. American Warming and Ventilating; a division of Mestek, Inc.
    c. Flexmaster U.S.A., Inc.
    d. McGill AirFlow LLC.
    e. METALAIRE, Inc.
    f. Nailor Industries Inc.
    g. Pottorff; a division of PCI Industries, Inc.
    h. Ruskin Company.
    i. Trox USA Inc.
    j. Vent Products Company, Inc.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

    a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
    b. Mitered and welded corners.
    c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Galvanized-steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

    a. Oil-impregnated bronze or molded synthetic.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

2.4 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. McGill AirFlow LLC.
6. METALAIRE, Inc.
7. Nailor Industries Inc.
8. NCA Manufacturing, Inc.
9. PHL, Inc.
10. Pottorff; a division of PCI Industries, Inc.
11. Prefco; Perfect Air Control, Inc.
12. Ruskin Company.
13. Vent Products Company, Inc.
14. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
15. Limited Enertech.

B. Type: Static; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 4000-fpm velocity.

D. Fire Rating: 3 hours.

E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.5 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.6 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

D. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.7 REMOTE DAMPER OPERATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pottorff; a division of PCI Industries, Inc.
2. Ventfabrics, Inc.
3. Young Regulator Company.

B. Description: Cable system designed for remote manual damper adjustment.

C. Tubing: Brass.

D. Cable: Stainless steel.

2.8 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Flexmaster U.S.A., Inc.
5. Greenheck Fan Corporation.
6. McGill AirFlow LLC.
7. Nailor Industries Inc.
8. Pottorff; a division of PCI Industries, Inc.
9. Ventfabrics, Inc.
10. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Vision panel.
d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.

d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.9 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0528-inch carbon or 0.0428-inch stainless steel to match duct material.

D. Fasteners: Carbon or stainless steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

F. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.11 FLEXIBLE DUCTS

A. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.

B. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

2.12 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.13 DUCT SILENCERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dynasonic.
2. Industrial Noise Control, Inc.
3. McGill AirFlow LLC.
4. Ruskin Company.
5. Commercial Acoustics.
6. Vibro-Acoustics.

B. General Requirements:

1. Factory fabricated.
2. Fire-Performance Characteristics: Adhesives, sealants, packing materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

C. Shape:

1. Rectangular straight with splitters or baffles.
2. Round straight with center bodies or pods.
3. Rectangular elbow with splitters or baffles.
4. Round elbow with center bodies or pods.

5. Rectangular transitional with splitters or baffles.

D. Rectangular Silencer Outer Casing: ASTM A 653/A 653M, G60, galvanized sheet steel, 0.040 inch thick.

E. Round Silencer Outer Casing: ASTM A 653/A 653M, G60, galvanized sheet steel.

1. Sheet Metal Thickness for Units up to 24 Inches in Diameter: 0.034 inch thick.
2. Sheet Metal Thickness for Units 26 through 40 Inches in Diameter: 0.040 inch thick.
3. Sheet Metal Thickness for Units 42 through 52 Inches in Diameter: 0.052 inch thick.

F. Inner Casing and Baffles: ASTM A 653/A 653M, G60 galvanized sheet metal, 0.034 inch thick, and with 1/8-inch- diameter perforations.

G. Connection Sizes: Match connecting ductwork unless otherwise indicated.

H. Principal Sound-Absorbing Mechanism:

1. Controlled impedance membranes and broadly tuned resonators without absorptive media.
2. Dissipative type with fill material.

a. Fill Material: Inert and vermin-proof fibrous material, packed under not less than 15 percent compression.
b. Erosion Barrier: Polymer bag enclosing fill, and heat sealed before assembly.

3. Lining: Fiberglas cloth.

I. Fabricate silencers to form rigid units that will not pulsate, vibrate, rattle, or otherwise react to system pressure variations. Do not use mechanical fasteners for unit assemblies.

1. Flange connections.
2. Suspended Units: Factory-installed suspension hooks or lugs attached to frame in quantities and spaced to prevent deflection or distortion.
3. Reinforcement: Cross or trapeze angles for rigid suspension.

J. Accessories:

1. Factory-installed end caps to prevent contamination during shipping.
2. Removable splitters.
3. Airflow measuring devices.

K. Source Quality Control: Test according to ASTM E 477.

1. Testing to be witnessed by Architect.
2. Record acoustic ratings, including dynamic insertion loss and generated-noise power levels with an airflow of at least 2000-fpm face velocity.
3. Leak Test: Test units for airtightness at 200 percent of associated fan static pressure or 6-inch wg static pressure, whichever is greater.

L. Capacities and Characteristics:

1. Configuration: Straight.
2. Shape: Rectangular.
3. Attenuation Mechanism: Acoustical glass fiber with protective film liner.
4. Maximum Pressure Drop: 0.35-inch wg.
5. Casing:

a. Attenuation: Standard.

b. Outer Material: Galvanized steel.
c. Inner Material: Galvanized steel.

6. Length: See plans.
7. Face Dimension: See plans

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft or control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

E. Where damper operators occur above non-accessible ceilings, extend operator down to ceiling and terminate with a concealed damper regulator.

F. Set dampers to fully open position before testing, adjusting, and balancing.

G. Install test holes at fan inlets and outlets and elsewhere as indicated.

H. Install fire dampers according to UL listing.

I. Install opposed-blade volume dampers in each and every zone duct downstream of multi-zone units.

J. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstreamand downstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from all manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-foot spacing.
8. Upstream and downstream from turning vanes.
9. Control devices requiring inspection.
10. Elsewhere as indicated.

K. Install access doors with swing against duct static pressure.

L. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

M. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

N. Install flexible connectors to connect ducts to equipment.

O. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

P. Connect diffusers boots to ducts directly or with maximum 48 inch lengths of flexible duct clamped or strapped in place.

Q. Connect flexible ducts to metal ducts with draw bands.

R. Install duct test holes where required for testing and balancing purposes.

S. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

T. Provide airtight and grease tight cleanout doors in kitchen hood exhaust ductwork. Provide at each connection in horizontal ducts, at each elbow, every 20' in straight duct and above every floor in vertical risers.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 23 3423

HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 Base Bid:

1. Contractor

    a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the HVAC drawings:

        1) Centrifugal roof ventilators and upblast fans.

B. Alternate Bid:

1. Contractor

    a. Alternate Bid No. 1: Does not apply.
    b. Alternate Bid No. 2: Does not apply.

1.2 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on sea level.

B. Operating Limits: Classify according to AMCA 99.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.
2. Design Calculations: Calculate requirements for selecting vibration isolators.
3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

C. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.6 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Acme Engineering & Mfg. Corp.
2. Carnes Company HVAC.
3. Greenheck.
4. Loren Cook Company.
5. Pennbarry.

D. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.

E. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains and grease collector.
2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.

F. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

G. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:

1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
4. Fan and motor isolated from exhaust airstream.

H. Accessories:

1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.

I. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Self-flashing without a cant strip, with mounting flange.
2. Overall Height: 12 inches.
3. Pitch Mounting: Manufacture curb for roof slope.
4. Metal Liner: Galvanized steel.

2.2 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

B. Enclosure Type: Totally enclosed, fan cooled.

2.3 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 07 Section "Roof Accessories" for installation of roof curbs.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
9. Shut unit down and reconnect automatic temperature-control operators.
10. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION

SECTION 23 3713

DIFFUSERS, REGISTERS AND GRILLES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the HVAC drawings:

1) Rectangular and square ceiling diffusers.
2) Louver face diffusers.
3) Continuous tubular diffusers.
4) Adjustable bar registers and grilles.
5) Fixed face grilles.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the HVAC drawings.

1.2 RELATED WORK

A. Related Sections:

1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Section 23 3300 - Air Duct Accessories for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

C. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

E. Source quality-control reports.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Anemostat Products; a Mestek company.
    b. Carnes.
    c. Nailor Industries Inc.
    d. Price Industries.
    e. Titus.
    f. Tuttle & Bailey.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum.
4. Finish: Baked enamel, color selected by Architect.
5. Face Size: 24 by 24 inches.
6. Face Style: Four cone.
7. Mounting: Surface and T-bar.
8. Pattern: Fixed.
9. Dampers: Opposed blade.
10. Accessories:

    a. Plaster ring.

B. Louver Face Diffuser:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Anemostat Products; a Mestek company.
    b. Carnes.
    c. Nailor Industries Inc.
    d. Price Industries.
    e. Titus.
    f. Tuttle & Bailey.

2. Devices shall be specifically designed for variable-air-volume flows.

3. Material: Aluminum.
4. Finish: Baked enamel, color selected by Architect.
5. Face Size: 24 by 24 inches.
6. Mounting: Surface and T-bar.
7. Pattern: Four-way core style.
8. Dampers: Opposed blade.
9. Accessories:

    a. Square to round neck adaptor.
    b. Equalizing grid.
    c. Plaster ring.

2.2 REGISTERS AND GRILLES

A. Adjustable Bar Register:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Anemostat Products; a Mestek company.
    b. Carnes.
    c. Nailor Industries Inc.
    d. Price Industries.
    e. Titus.
    f. Tuttle & Bailey.

2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Face Blade Arrangement: Vertical spaced 3/4 inch apart.
5. Core Construction: Integral.
6. Rear-Blade Arrangement: Horizontal spaced 3/4 inch apart.
7. Frame: 1-1/4 inches wide.
8. Mounting Frame: See drawings.
9. Mounting: Countersunk screw.
10. Damper Type: Adjustable opposed blade.
11. Accessories:

    a. Front-blade gang operator.

B. Adjustable Bar Grille:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Anemostat Products; a Mestek company.
    b. Carnes.
    c. Nailor Industries Inc.
    d. Price Industries.
    e. Titus.
    f. Tuttle & Bailey.

2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Face Blade Arrangement: Vertical spaced 3/4 inch apart.
5. Core Construction: Integral.
6. Rear-Blade Arrangement: Horizontal spaced 3/4 inch apart.
7. Frame: 1-1/4 inches wide.

8. Mounting Frame: See drawing.
9. Mounting: Countersunk screw.

C. Fixed Face Grille:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Anemostat Products; a Mestek company.
b. Carnes.
c. Nailor Industries Inc.
d. Price Industries.
e. Titus.
f. Tuttle & Bailey.

2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.
5. Core Construction: Removable.
6. Frame: 1-1/4 inches wide.
7. Mounting Frame: Filter.
8. Mounting: Countersunk screw and Lay in.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 23 7433

PACKAGED, OUTDOOR, HEATING AND COOLING MAKEUP AIR-CONDITIONERS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the HVAC drawings:

1) Rooftop make-up air units.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, methods of field assembly, components, and location and size of each field connection. Prepare the following by or under the supervision of a qualified professional engineer:

1. Design Calculations: For selecting and designing restrained vibration isolation roof-curb rails.
2. Mounting Details: For securing and flashing roof curb to roof structure. Indicate coordinating requirements with roof membrane system.
3. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Rooftop replacement-air units to roof-curb mounting details drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Size and location of rooftop replacement-air unit mounting rails and anchor points and methods for anchoring units to roof curb.
2. Required roof penetrations for ducts, pipes, and electrical raceways, including size and location of each penetration.

D. Startup service reports.

E. Operation and Maintenance Data: For rooftop make-up air units to include in emergency, operation, and maintenance manuals.

F. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of rooftop replacement-air units and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to Authorities Having Jurisdiction, and marked for intended use.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.4 COORDINATION

A. Coordinate size, installation, and structural capacity of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

B. Coordinate size, location, and installation of rooftop make-up air unit manufacturer's roof curbs and equipment supports with roof Installer.

1. Coordinate installation of restrained vibration isolation roof-curb rails, which are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components listed below that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
2. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than five years from date of Substantial Completion.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan Belts: One set for each belt-driven fan.
2. Filters: One set for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS FOR KITCHEN MAKE-UP AIR UNIT

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AAON, Inc.
2. York.
3. Des Champs Laboratories, Incorporated.
4. Trane.
5. Reznor-Thomas & Betts Corporation; Mechanical Products Division.
6. Greenheck.

2.2 CABINET

A. Construction: Single wall.

B. Exterior Casing: Galvanized steel with baked-enamel paint finish and with lifting lugs and knockouts for electrical and piping connections.

C. Interior Casing: Galvanized steel.

D. Base Rails: Galvanized-steel rails for mounting on roof curb.

E. Service Doors: Hinged access doors with neoprene gaskets.

F. Internal Insulation: Fibrous-glass duct lining complying with ASTM C 1071, Type II.

1. Thickness: 1½ inches.
2. Insulation Adhesive: Comply with ASTM C 916, Type I.
3. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to casing without damaging liner and without causing air leakage when applied as recommended by manufacturer.

G. Condensate Drain Pans: Formed sections of galvanized-steel sheet designed for self-drainage. Fabricate pans and drain connection to comply with ASHRAE 62.1-2004.

H. Roof Curb: Full-perimeter curb of sheet metal, minimum 12 inches high, with wood nailer, neoprene sealing strip, and welded Z-bar flashing.

I. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

2.3 SUPPLY-AIR FAN

A. Fan: Forward-curved centrifugal; statically and dynamically balanced, galvanized steel, mounted on solid-steel shaft with pillow-block bearings rated L_{50} for 200,000 hours and having external grease fittings.

B. Motor: Open dripproof, single-speed motor.

C. Drive: V-belt drive with matching fan pulley and adjustable motor sheaves and belt assembly with minimum 1.4 service factor.

D. Mounting: Fan wheel, motor, and drives shall be mounted in fan casing with elastomeric isolators.

2.4 DIRECT-FIRED GAS FURNACE

A. Description: Factory assembled, piped, and wired; complying with NFPA 54, "National Fuel Gas Code"; ANSI Z83.4, "Non-Recirculating Direct Gas-Fired Industrial Air Heaters"; and ANSI Z83.18, "Direct Gas-Fired Industrial Air Heaters," for direct-fired gas furnace.

B. Burners: Cast-iron burner with stainless-steel mixing plates.

1. Rated for a maximum turndown ratio of 30:1.
2. Fuel: Natural gas.

C. Safety Controls:

1. Gas manifold safety switches and controls shall comply with ANSI standards and IRI.
2. Pilot: Intermittent spark igniter.
3. Purge-period timer shall automatically delay burner ignition and bypass low-limit control.
4. External gas-pressure regulator shall regulate pressure to not more than 0.5 psig.
5. Airflow Proving Switch: Dual pressure switch senses correct airflow before energizing pilot and requires airflow to be maintained within minimum and maximum pressure settings across burner.
6. Manual-Reset, High-Limit Switch: Stops burner and closes main gas valve if high-limit temperature is exceeded.
7. Gas Train: Redundant, main gas valves, electric pilot valve, main and pilot gas-pressure regulators, main and pilot manual shutoff valves, main and pilot pressure taps, and high-low gas-pressure switches to comply with IRI requirements.

2.5 OUTDOOR-AIR INTAKE AND DAMPERS

A. Dampers: Leakage rate, according to AMCA 500, shall not exceed 2 percent of air quantity at face velocity of 2000 fpm through damper and pressure differential of 4-inch wg.

B. Damper Operators: Electric.

C. Mixing Boxes: Parallel-blade, galvanized-steel dampers mechanically fastened to steel operating rod inside cabinet. Connect operating rods with common interconnecting linkages so dampers operate simultaneously.

D. Outdoor-Air Intake Hoods: Galvanized steel, with bird screen complying with ASHRAE 62.1-2004 and finish to match cabinet.

2.6 FILTERS

A. Comply with NFPA 90A.

B. Cleanable Filters: 2-inch- thick, cleanable metal mesh.

2.7 CONTROLS

A. Control equipment and sequence of operation are specified in Division 23 Section "Instrumentation and Control for HVAC."

B. Factory-wire connection for controls' power supply.

C. Control devices, including sensors, transmitters, relays, switches, thermostats, humidistats, detectors, operators, actuators, and valves, shall be manufacturer's standard items to accomplish indicated control functions.

D. Unit Controls: Solid-state control board and components with field-adjustable control parameters.

E. Supply-Fan Control: Units shall be electrically interlocked with corresponding exhaust fans, to operate continuously when exhaust fans are running. Time clock shall switch operation from occupied to unoccupied. Night setback thermostat shall cycle fan during unoccupied periods to maintain space temperature.

1. Electrically interlock kitchen hood fire-extinguishing system to de-energize replacement-air unit when fire-extinguishing system discharges.

F. Remote-Mounted Status Panel:

1. Cooling/Off/Heating Controls: Control operational mode.
2. Damper Position: Indicates position of outdoor-air dampers in terms of percentage of outdoor air.
3. Status Lights:

a. Filter dirty.
b. Fan operating.
c. Heating operating.

G. Heating Controls:

1. Factory-mounted sensor in supply-fan outlet with sensor adjustment located in control panel modulates gas furnace burner to maintain space temperature.
2. Wall-mounting, space-temperature sensor with adjustment on remote-control panel that modulates gas furnace burner to maintain space temperature.
3. Electronic Burner Control: 20 to 100 percent modulation of the firing rate. 10 to 100 percent with dual furnace units.

H. Damper Controls:

1. When exhaust fans stop, set outdoor- and return-air damper to 0 percent outdoor air. When exhaust fans start, fully open outdoor-air damper.

I. Integral Smoke Alarm: Smoke detector installed in supply air.

2.8 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

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 installation of rooftop make-up air units.

B. Examine roughing-in for piping, ducts, and electrical systems to verify actual locations of connections before equipment installation.

C. Examine roof curbs and equipment supports for suitable conditions where rooftop replacement-air units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install roof curb on roof structure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install and secure rooftop replacement-air units on curbs and coordinate roof penetrations and flashing with roof construction.

B. Install wall- and duct-mounting sensors and thermostats furnished by manufacturers for field installation. Install control wiring and make final connections to control devices and unit control panel.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

1. Gas Burner Connections: Comply with requirements in Division 23 Section "Facility Natural-Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union, pressure regulator, and shutoff valve with sufficient clearance for burner removal and service.

C. Duct Connections: Duct installation requirements are specified in Division 23 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply ducts to rooftop replacement-air units with flexible duct connectors. Flexible duct connectors are specified in Division 23 Section "Air Duct Accessories."

D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

E. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

1. Inspect for visible damage to furnace combustion chamber.
2. Inspect casing insulation for integrity, moisture content, and adhesion.
3. Verify that clearances have been provided for servicing.
4. Verify that controls are connected and operable.
5. Verify that filters are installed.
6. Clean outside coil and inspect for construction debris.
7. Clean furnace flue and inspect for construction debris.
8. Inspect operation of power vents.

9. Purge gas line.
10. Inspect and adjust vibration isolators.
11. Verify bearing lubrication.
12. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
13. Adjust fan belts to proper alignment and tension.
14. Start unit.
15. Inspect and record performance of interlocks and protective devices including response to smoke detectors by fan controls and fire alarm.
16. Operate unit for run-in period.
17. Perform the following operations for both minimum and maximum firing and adjust burner for peak efficiency:

    a. Measure gas pressure at manifold.
    b. Measure combustion-air temperature at inlet to combustion chamber.
    c. Measure flue-gas temperature at furnace discharge.
    d. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
    e. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

18. Calibrate thermostats.
19. Adjust and inspect high-temperature limits.
20. Inspect outdoor-air dampers for proper stroke.
21. Verify operational sequence of controls.
22. Measure and record the following airflows. Plot fan volumes on fan curve.

    a. Supply-air volume.

23. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

    a. High-limit heat exchanger.
    b. Alarms.

C. After startup and performance testing, change filters, verify bearing lubrication, and adjust belt tension.

D. Remove and replace components that do not pass tests and inspections and retest as specified above.

E. Prepare written report of the results of startup services.

3.5 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain rooftop replacement-air units. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 23 8146

WATER-SOURCE UNITARY HEAT PUMPS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the HVAC drawings:

1) Exposed console water-source heat pump.
2) Concealed horizontal or vertical units, 6 tons and smaller.
3) Concealed horizontal or vertical units, larger than 6 tons.
4) Rooftop units and dedicated outdoor air units.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each model.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which heat pumps will be attached.
3. Method of attaching hangers to building structure.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling, including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each type of unit indicated.

F. Product Certificates: For each type of water-source heat pump, signed by product manufacturer.

G. Field quality-control test reports.

H. Operation and Maintenance Data: For water-source heat pumps to include in emergency, operation, and maintenance manuals.

I. Warranty: Special warranty specified in this Section.

J. Contractor shall include premium cost for delivery of equipment to ensure no impact to project completion date.

1.3 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of water-source heat pumps and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. ASHRAE Compliance:

1. ASHRAE 15.
2. Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

E. Comply with NFPA 70.

F. Comply with safety requirements in UL 484 for assembly of free-delivery water-source heat pumps.

G. Comply with safety requirements in UL 1995 for duct-system connections.

1.4 COORDINATION

A. Coordinate layout and installation of water-source heat pumps and suspension components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components, and partition assemblies.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of water-source heat pumps that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, refrigeration components.
2. Warranty Period: Five years from date of Substantial Completion and include parts and labor.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. One set of matched fan belts for each belt-driven fan.
2. One set of filters for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 VERTICAL CLASSROOM WATER-SOURCE HEAT PUMPS, 6 TONS AND SMALLER

A. Manufacturers:

1. Bard.
2. Trane.
3. Change Air
4. Airedale.

B. Description: Packaged water-source heat pump with field mounted controls, unit tested and rated according to AR1-ISO-B256-1. Field mount heat pump temperature controls shall be BACnet MS/TP compatible by Temperature Control Contract for 2-stage heating / cooling.

C. Cabinet and Chassis: Pre-painted, galvanized-steel casing with the following features:

1. Access panel for access and maintenance of internal components.
2. Knockouts for electrical and piping connections.
3. Flanged duct connections.
4. Cabinet Insulation: Glass-fiber liner, minimum ½ inch thick, complying with UL 181.
5. Condensate Drainage: Stainless-steel drain pan with condensate drain piping projecting through unit cabinet.
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
7. Sound Attenuation Package:

a. Minimum 0.598-inch- thick compressor enclosure and front panel. Minimum 0.0937-inch- thick foam gasket around the compressor and perimeter of end panel.
b. Sound attenuating blanket over compressor.
c. Sound attenuating material over fan scroll.
d. Hot-gas muffler.

D. Fan: Direct driven, centrifugal, with multispeed motor resiliently mounted in fan inlet.

1. General requirements for motors are specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
2. Motor: Multispeed, permanently lubricated, ECM motor.

E. Water Circuit:

1. Refrigerant-to-Water Heat Exchangers:

a. Coaxial heat exchangers with copper water tube with enhanced heat-transfer surfaces inside a steel shell; both shell and tube leak tested to 450 psig on refrigerant side and 400 psig on water side. Factory mount heat exchanger in unit on resilient rubber vibration isolators.

F. Refrigerant-to-Air Coils: Internally enhanced copper tubes with aluminum fins, leak tested to 450 psig.

G. Refrigerant Circuit Components:

1. Sealed Refrigerant Circuit: Charge with R-407C or R-410A refrigerant.
2. Thermostatic expansion valve.
3. Charging Connections: Service fittings on suction and liquid for charging and testing.
4. Reversing Valve: Pilot-operated sliding-type valve designed to be fail-safe in heating position with replaceable magnetic coil.
5. Compressor: Hermetic 2-stage scroll compressor installed on vibration isolators and housed in an acoustically treated enclosure with factory-installed safeties as follows:

a. High-pressure cutout.
b. Low-pressure cutout or loss of charge switch.
c. Internal thermal-overload protection.

6. Refrigerant Piping Materials: ASTM B 743 copper tube with wrought-copper fittings and brazed joints.
7. Pipe Insulation: Refrigerant minimum 3/8-inch- thick, flexible elastomeric insulation on piping exposed to airflow through the unit. Maximum 25/50 flame-spread/smoke-development indexes according to ASTM E 84.
8. Refrigerant Metering Device: Thermal expansion valve to allow specified operation with entering-water temperatures from 20 to 120 deg F.
9. Provide hot-gas reheat coil for dehumidification.

H. Filters: Shall be disposal pleated type, 2 inch thick and a MERV rating of 8 or higher.

I. Provide factory mounted LED UV light strip inside the unit.

J. Control equipment and sequence of operation are specified in Division 23 Sections "Instrumentation and Controls for HVAC" and "Sequence of Operations for HVAC Controls."

K. Electrical Connection: Single electrical connection with fused disconnect.

L. Units shall have 2-way or 3-way, 2-position line sized control valves. Valves shall be provided by Contractor. Valve shall open and close based on unit / compressor operation. Coordinate valve type with manufacturer."

M. Provide field mounted humidistat, thermostat and CO_2 sensor furnished by unit manufacturer. Sensors shall be BACnet or MSTP compatible.

N. Provide supply air discharge plenum in trim kits.

O. Thermostat and CO_2 sensor shall be wall-mounted with final location coordinated with Owner.

P. Provide sound attenuation kit.

Q. Optional energy recovery for classroom units. 100% Outdoor Air Units shall be fitted with an Energy Recovery Ventilator (ERV) section. ERV shall be a factory assembled, single piece unit. Contained within the unit enclosure shall be all factory wiring with a single, pre-determined point of power input and a single point of 24 volt control wiring.

1. Unit Cabinet: Shall be constructed of galvanized steel coated with a prepainted baked enamel finish.

    a. The pre-conditioned area of the exhaust air stream and post-conditioned area of the supply air stream shall be insulated with a 1 inch, 2 pound density foil faced insulation or unfaced insulation contained within a double walled panel.
    b. Cabinet panels shall be hinged.
    c. Exhaust and supply air streams shall have back-draft dampers to prevent air penetration during off cycles.
    d. Holes shall be provided in the base rails for rigging shackles to facilitate overhead rigging.

2. Blowers: Exhaust air and supply air blowers shall be arranged to draw air through the energy recovery wheel.

    a. Blowers shall be belt driven, double inlet type with forward-curved blades.
    b. Belt shall include an adjustable pulley.
    c. Blower wheel shall be made from steel with a corrosion resistant finish.
    d. It shall be a dynamically balanced.

3. Energy Recovery Cassette shall be an UL recognized component for electrical and fire safety.

    a. The energy recovery media (lightweight polymer) shall be a nominal 70% effective. Efficiency ratings shall be ARI 1060 certified.
    b. The wheel must have desiccant permanently integrated into the media of the wheel.
    c. 2" 30% filters shall be provided upstream of the wheel in both the exhaust air and outdoor air streams.

4. Controls and Safeties: ERV unit shall operate in conjunction with HVAC unit fan.

    a. Motorized supply and return dampers shall be wired to open whenever the unit is running.

5. The operation of the energy recovery ventilator shall be controlled by the CO2 sensor. The amount of fresh air listed on the schedule. The amount of exhaust air shall be set less than the fresh air setting to provide building pressurization.

2.3 HOSE KITS

A. General: Hose kits shall be designed for minimum 400 psig working pressure, and operating temperatures from 33 to 211 deg F. Tag hose kits to equipment designations.

B. Hose: Length 24 inches. Minimum diameter, equal to water-source heat-pump connection size.

C. Isolation Valves: Two-piece bronze-body ball valves with stainless-steel ball and stem and galvanized-steel lever handle. Provide valve for supply and return. If balancing device is combination shutoff type with memory stop, the isolation valve may be omitted on the return.

D. Strainer: Y-type with blowdown valve in supply connection.

E. Balancing Device: Mount in return connection. Include meter ports to allow flow measurement with differential pressure gage.

1. Manual, calibrated-orifice balancing valve.
2. Manual, venturi-type balancing valve.

2.4 EXPOSED, CONSOLE WATER-SOURCE HEAT PUMPS

A. Manufacturers:

1. ClimateMaster, Inc.
2. FHP Manufacturing Inc.
3. Trane.
4. WaterFurnace International, Inc.
5. McQuay.

B. Description: Packaged water-source heat pump with temperature controls; field installed, tested, and rated according to ARI-ISO-13256-1.

C. Cabinet and Chassis: Manufacturer's standard-height, sloped-top, galvanized-steel casing with the following features:

1. Access panel for access and maintenance of internal components.
2. Knockouts for electrical and piping connections.
3. Cabinet Insulation: Glass-fiber liner, ½ inch thick, complying with UL 181.
4. Condensate Drainage: Plastic or stainless-steel drain pan with condensate drain piping projecting to unit exterior and complying with ASHRAE 62.1-2004.
5. Discharge Grille: Aluminum, rigid bar grille for adjustable discharge air pattern.
6. Color: Selected by Architect from manufacturer's standard color selection.
7. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

D. Fan: Direct driven, centrifugal, with multispeed motor mounted on a removable fan-motor board.

1. General requirements for motors are specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
2. Motor: Multispeed, permanently lubricated, permanent split capacitor.

E. Water Circuit:

1. Refrigerant-to-Water Heat Exchanger: Coaxial heat exchanger with copper water tube with enhanced heat-transfer surfaces inside a steel shell; both shell and tube leak tested to 450 psig for refrigerant side and 400 psig for water side. Mount heat exchanger in unit on resilient rubber vibration isolators.

F. Refrigerant-to-Air Coils: Copper tubes with aluminum fins, leak tested to 450 psig.

G. Refrigerant Circuit Components:

1. Sealed Refrigerant Circuit: Charge with R-407C or R-410A refrigerant.
2. Charging Connections: Service fittings on suction and liquid for charging and testing.
3. Reversing Valve: Pilot-operated sliding-type valve designed to be fail-safe in heating position with replaceable magnetic coil.
4. Compressor: Hermetic rotary compressor installed on vibration isolators housed in an acoustically treated enclosure with factory-installed safeties as follows:

    a. Antirecycle timer.
    b. High-pressure cutout.
    c. Low-pressure cutout or loss of charge switch.
    d. Internal thermal-overload protection.
    e. Freezestat to stop compressor if water-loop temperature in refrigerant-to-water heat exchanger falls below 20 deg F.
    f. Condensate overflow switch to stop compressor with high condensate level in condensate drain pan.

5. Refrigerant Piping Materials: ASTM B 743 copper tube with wrought-copper fittings and brazed joints.
6. Pipe Insulation: Refrigerant minimum 3/8-inch- thick, flexible elastomeric insulation on piping exposed to airflow through the unit. Maximum 25/50 flame-spread/smoke-development indexes per ASTM E 84.
7. Refrigerant Metering Device:

    a. Thermal expansion valve to allow specified operation with entering-water temperatures from 20 to 120 deg F.

H. Filters: Disposable, glass-fiber, flat type, 1 inch thick, treated with adhesive, and having a minimum of 80 percent arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value of 5 according to ASHRAE 52.2.

I. Control equipment and sequence of operation are specified in Division 23 Sections "Instrumentation and Controls for HVAC" and "Sequence of Operations for HVAC Controls."

J. Provide 2-position valve for units installed in existing building.

2.5 CONCEALED WATER-SOURCE HEAT PUMPS, 6 TONS AND SMALLER

A. Manufacturers:

1. ClimateMaster, Inc.
2. FHP Manufacturing Inc.
3. Trane.
4. WaterFurnace International, Inc.
5. Carrier.

B. Description: Packaged water-source heat pump with temperature controls; field installed, tested, and rated according to ARI-ISO-13256-1.

C. Cabinet and Chassis: Galvanized-steel casing with the following features:

1. Access panel for access and maintenance of internal components.
2. Knockouts for electrical and piping connections.

3. Flanged duct connections.
4. Cabinet Insulation: Glass-fiber liner, minimum ½ inch thick, complying with UL 181.
5. Condensate Drainage: Stainless-steel drain pan with condensate drain piping projecting through unit cabinet.
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

7. Sound Attenuation Package:

    a. Minimum 0.598-inch- thick compressor enclosure and front panel. Minimum 0.0937-inch- thick foam gasket around the compressor and perimeter of end panel.
    b. Sound attenuating blanket over compressor.
    c. Sound attenuating material over fan scroll.
    d. Hot-gas muffler.

D. Fan: Direct driven, centrifugal, with multispeed motor resiliently mounted in fan inlet.

1. General requirements for motors are specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
2. Motor: Multispeed, permanently lubricated, ECM motor.

E. Water Circuit:

1. Refrigerant-to-Water Heat Exchangers:

    a. Coaxial heat exchangers with copper water tube with enhanced heat-transfer surfaces inside a steel shell; both shell and tube leak tested to 450 psig on refrigerant side and 400 psig on water side. Factory mount heat exchanger in unit on resilient rubber vibration isolators.

F. Refrigerant-to-Air Coils: Internally enhanced copper tubes with aluminum fins, leak tested to 450 psig.

G. Refrigerant Circuit Components:

1. Sealed Refrigerant Circuit: Charge with R-407C or R-410A refrigerant.
2. Thermostatic expansion valve.
3. Charging Connections: Service fittings on suction and liquid for charging and testing.
4. Reversing Valve: Pilot-operated sliding-type valve designed to be fail-safe in heating position with replaceable magnetic coil.
5. Compressor: Hermetic scroll compressor installed on vibration isolators and housed in an acoustically treated enclosure with factory-installed safeties as follows:

    a. High-pressure cutout.
    b. Low-pressure cutout or loss of charge switch.
    c. Internal thermal-overload protection.
    d. Freezestat to stop compressor if water-loop temperature in refrigerant-to-water heat exchanger falls below 20 deg F.
    e. Condensate overflow switch to stop compressor with high condensate level in condensate drain pan.

6. Refrigerant Piping Materials: ASTM B 743 copper tube with wrought-copper fittings and brazed joints.
7. Pipe Insulation: Refrigerant minimum 3/8-inch- thick, flexible elastomeric insulation on piping exposed to airflow through the unit. Maximum 25/50 flame-spread/smoke-development indexes according to ASTM E 84.
8. Refrigerant Metering Device: Thermal expansion valve to allow specified operation with entering-water temperatures from 20 to 120 deg F.

H. Filters: Disposable, pleated type, 2 inch thick and with a minimum of 90 percent arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value of 11 according to ASHRAE 52.2. Filters shall be standard sizes.

I. Control equipment and sequence of operation are specified in Division 23 Sections "Instrumentation and Controls for HVAC" and "Sequence of Operations for HVAC Controls."

J. Electrical Connection: Single electrical connection with fused disconnect.

K. Unit loop water 2-way control valve provided by unit manufacturer.

2.6 CONCEALED WATER-SOURCE HEAT PUMPS, 6 TONS AND LARGER

A. Manufacturers:

1. ClimateMaster, Inc.
2. FHP Manufacturing Inc.
3. Trane.
4. WaterFurnace International, Inc.

B. Description: Packaged water-source heat pump with temperature controls; field installed, tested, and rated according to ARI-ISO-13256-1.

C. Cabinet and Chassis: Painted, galvanized-steel casing with the following features:

1. Access panel for access and maintenance of internal components.
2. Knockouts for electrical and piping connections.
3. Flanged duct connections.
4. Cabinet Insulation: Glass-fiber liner, minimum ½ inch thick, complying with UL 181.
5. Condensate Drainage: Stainless-steel drain pan with condensate drain piping projecting through unit cabinet.
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
7. Paint color selected by Architect.
8. Sound Attenuation Package:

    a. Minimum 0.598-inch- thick compressor enclosure and front panel. Minimum 0.0937-inch- thick foam gasket around the compressor and perimeter of end panel.
    b. Sound attenuating blanket over compressor.
    c. Sound attenuating material over fan scroll.
    d. Hot-gas muffler.

D. Fan: Direct driven, centrifugal, with multispeed motor resiliently mounted in fan inlet.

1. General requirements for motors are specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
2. Motor: Multispeed, permanently lubricated, ECM motor.

E. Water Circuit:

1. Refrigerant-to-Water Heat Exchangers:

    a. Coaxial heat exchangers with copper water tube with enhanced heat-transfer surfaces inside a steel shell; both shell and tube leak tested to 450 psig on refrigerant side and 400 psig on water side. Factory mount heat exchanger in unit on resilient rubber vibration isolators.

F. Refrigerant-to-Air Coils: Internally enhanced copper tubes with aluminum fins, leak tested to 450 psig.

G. Refrigerant Circuit Components:

1. Sealed Refrigerant Circuit: Charge with R-407C or R-410A refrigerant.
2. Thermostatic expansion valve.
3. Charging Connections: Service fittings on suction and liquid for charging and testing.
4. Reversing Valve: Pilot-operated sliding-type valve designed to be fail-safe in heating position with replaceable magnetic coil.
5. Compressor: Two (2) hermetic scroll compressors installed on vibration isolators and housed in an acoustically treated enclosure with factory-installed safeties as follows:

    a. High-pressure cutout.
    b. Low-pressure cutout or loss of charge switch.
    c. Internal thermal-overload protection.
    d. Freezestat to stop compressor if water-loop temperature in refrigerant-to-water heat exchanger falls below 20 deg F.
    e. Condensate overflow switch to stop compressor with high condensate level in condensate drain pan.

6. Refrigerant Piping Materials: ASTM B 743 copper tube with wrought-copper fittings and brazed joints.
7. Pipe Insulation: Refrigerant minimum 3/8-inch- thick, flexible elastomeric insulation on piping exposed to airflow through the unit. Maximum 25/50 flame-spread/smoke-development indexes according to ASTM E 84.
8. Refrigerant Metering Device: Thermal expansion valve to allow specified operation with entering-water temperatures from 20 to 120 deg F.

H. Filters: Disposable, pleated type, 2 inch thick and with a minimum of 90 percent arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value of 11 according to ASHRAE 52.2. Filters shall be standard sizes. Provide manufacturer filter rack with filter access door.

I. Control equipment and sequence of operation are specified in Division 23 Sections "Instrumentation and Controls for HVAC" and "Sequence of Operations for HVAC Controls."

J. Electrical Connection: Single electrical connection with fused disconnect.

K. Unit loop water 2-way control valve provided by unit manufacturer.

L. Provide unit controls with CO_2 and dehumidification control.

M. Provide hot-gas reheat.

N. Provide factory controls that are BACnet or MSTP compatible.

2.7 WATER-SOURCE HEAT PUMP ROOFTOP UNITS AND 100% OUTSIDE AIR UNIT

A. Manufacturers:

1. ClimateMaster, Inc.
2. FHP Manufacturing Inc.
3. Trane.
4. WaterFurnace International, Inc.
5. AAON.

B. Description: Packaged water-source heat pump with temperature controls; field installed, tested, and rated according to ARI-ISO-13256-1.

C. Cabinet and Chassis: Galvanized-steel casing with the following features:

1. Water- and air-tight access panels for access and maintenance of internal components.
2. Knockouts for electrical and piping connections.
3. Flanged duct connections.
4. Cabinet Insulation: Glass-fiber liner, 1 inch thick, complying with UL 181.
5. Condensate Drainage: Stainless-steel drain pan with condensate drain piping projecting to unit exterior and complying with ASHRAE 62.1-2004.
6. Exterior Finish: Color selected by Architect from manufacturer's standard color selection.
7. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

D. Indoor Fan: Forward curved centrifugal, with belt-drive, single-speed motor with adjustable motor sheave installed on an adjustable fan base resiliently mounted in cabinet.

1. General requirements for motors are specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

E. Water Circuit:

1. Refrigerant-to-Water Heat Exchanger:

a. Coaxial heat exchanger with copper water tube with enhanced heat-transfer surfaces inside a steel shell; both shell and tube leak tested to 450 psig on refrigerant side and 400 psig on water side. Factory mount heat exchanger in unit on resilient rubber vibration isolators.
b. Stainless-steel brazed plate heat exchanger leak tested to 450 psig on refrigerant side and 400 psig on water side. Factory mount heat exchanger in unit on resilient rubber vibration isolators.

F. Refrigerant-to-Air Coils: Copper tubes with aluminum fins, leak tested to 450 psig.

G. Refrigerant Circuit Components:

1. Sealed Refrigerant Circuit: . Minimum of 2 circuits required for units 8 tons and larger. Intertwine circuits in refrigerant to air coil.

a. Charge with R-407C or R-410A refrigerant.

2. Filter-Dryer: Factory installed to clean and dehydrate each refrigerant circuit.
3. Charging Connections: Service fittings on suction and liquid for charging and testing on each circuit.
4. Reversing Valve: Pilot-operated sliding-type valve designed to be fail-safe in heating position with replaceable magnetic coil.
5. Compressor: Hermetic scroll compressor installed on vibration isolators housed in an acoustically treated enclosure with factory-installed safeties as follows:

a. Antirecycle timer.
b. High-pressure cutout.
c. Low-pressure cutout or loss of charge switch.
d. Internal thermal-overload protection.
e. Freezestat to stop compressor if water-loop temperature in refrigerant-to-water heat exchanger falls below 20 deg F.

f. Condensate overflow switch to stop compressor with high condensate level in condensate drain pan.

6. Refrigerant Piping Materials: ASTM B 743 copper tube with wrought-copper fittings and brazed joints.
7. Pipe Insulation: Refrigerant minimum 3/8-inch- thick, flexible elastomeric insulation on piping exposed to airflow through the unit. Maximum 25/50 flame-spread/smoke-development indexes per ASTM E 84.
8. Refrigerant Metering Device: Thermal expansion valve to allow specified operation with entering-water temperatures from 20 to 110 deg F.
9. Hot-Gas Reheat Valve: Pilot-operated sliding-type valve with replaceable magnetic coil.

H. Hot-Gas Reheat: Reheat valve diverts refrigerant hot gas to reheat coil when remote humidistat calls for dehumidification.

I. Air-Side Economizer: Return-, relief-, and outdoor-air dampers with neoprene seals and with weather-resistant hood.

1. Damper Motors: Fully modulating spring return with adjustable minimum position potentiometer.
2. Temperature Control: Microprocessor-based controller using outdoor-air, mixed-air temperature and selects between outdoor-air and return-air enthalpy to adjust mixing dampers with water-loop entering temperature greater than 70 deg F. Delay opening outdoor-air damper to minimum position until room thermostat is satisfied at room set-point temperature.
3. Ventilation Control: Provide carbon dioxide sensor to reset minimum outdoor-air intake rate to minimum 10 percent to maintain maximum 800 ppm concentration of carbon dioxide in return air.
4. Relief Damper: Gravity-actuated damper with bird screen and hood.

J. 100% Outdoor Air Units shall be fitted with an Energy Recovery Ventilator (ERV) section. ERV shall be a factory assembled, single piece unit. Contained within the unit enclosure shall be all factory wiring with a single, pre-determined point of power input and a single point of 24 volt control wiring.

1. Unit Cabinet: Shall be constructed of galvanized steel coated with a prepainted baked enamel finish.

a. The pre-conditioned area of the exhaust air stream and post-conditioned area of the supply air stream shall be insulated with a 1 inch, 2 pound density foil faced insulation or unfaced insulation contained within a double walled panel.
b. Cabinet panels shall be hinged.
c. Exhaust and supply air streams shall have back-draft dampers to prevent air penetration during off cycles.
d. Holes shall be provided in the base rails for rigging shackles to facilitate overhead rigging.

2. Blowers: Exhaust air and supply air blowers shall be arranged to draw air through the energy recovery wheel.

a. Blowers shall be belt driven, double inlet type with forward-curved blades.
b. Belt shall include an adjustable pulley.
c. Blower wheel shall be made from steel with a corrosion resistant finish.
d. It shall be a dynamically balanced.

3. Energy Recovery Cassette shall be an UL recognized component for electrical and fire safety.

a. The energy recovery media (lightweight polymer) shall be a nominal 70% effective. Efficiency ratings shall be ARI 1060 certified.
b. The wheel must have desiccant permanently integrated into the media of the wheel.
c. 2" 30% filters shall be provided upstream of the wheel in both the exhaust air and outdoor air streams.

4. Controls and Safeties: ERV unit shall operate in conjunction with HVAC unit fan.

a. Motorized supply and return dampers shall be wired to open whenever the unit is running.
b. Wheel By-pass: an air sensor shall prevent the wheel from rotating if the outside air conditions are acceptable for free cooling. Both exhaust and supply blowers will remain on.

5. Frost Protection: Frost protection module shall sense pressure differential across the energy recovery cassette.

a. Supply blower must be shut-off if the pressure differential across the energy recovery cassette exceeds a factory set point. Blower shall remain off for an adjustable period of time.
b. Exhaust blower and wheel shall remain in operation in order to remove any frost build-up on the wheel.

K. Filters: Disposable, pleated type, 2 inches thick and with a minimum of 90 percent arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value of 11 according to ASHRAE 52.2.

L. Roof Curb: Steel, with corrosion-protection coating, gasketing, and factory-installed wood nailer; complying with NRCA standards; minimum height of 14 inches.

M. Control equipment and sequence of operation are specified in Division 23 Sections "Instrumentation and Controls for HVAC" and "Sequence of Operations for HVAC Controls."

N. Provide factory controls that are BACnet or MSTP compatible.

O. Provide 3-way loop water control valve by unit manufacturer for MAU-1 and RTU-1 and RTU-3. Provide 2-way control valve for RTU-2 and RTU-5 and MAU-2 and MAU-3.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of water-source heat pumps.

B. Examine roughing-in for piping and electric installations for water-source heat pumps to verify actual locations of piping connections and electrical conduit before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Suspend water-source heat pumps from structure with threaded steel rods and vibration isolators. Vibration isolators are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

B. Curb Support: Install roof curb on roof structure, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install and secure rooftop water-source heat pumps on curbs and coordinate roof penetrations and flashing with roof construction.

C. Install wall-mounting thermostats, humidistats, and switch controls in electrical outlet boxes at heights to match lighting controls or as required in Division 23 Section "Instrumentation and Control for HVAC."

3.3 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:

1. Connect supply and return hydronic piping to heat pump with hose kits.
2. Connect heat-pump condensate drain pan to indirect waste connection with condensate trap of adequate depth to seal against the pressure of fan. Install cleanouts in piping at changes of direction.

B. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts. Specific connection requirements are as follows:

1. Connect supply and return ducts to water-source heat pumps with flexible duct connectors specified in Division 23 Section "Air Duct Accessories."
2. Install ducts to termination in roof curb.
3. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.

C. Install electrical devices furnished by manufacturer but not specified to be factory mounted.

D. Install piping adjacent to machine to allow service and maintenance.

E. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

F. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. After installing water-source heat pumps and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to compressor, coils, and fans.
3. Inspect internal insulation.
4. Verify that labels are clearly visible.
5. Verify that clearances have been provided for servicing.
6. Verify that controls are connected and operable.
7. Verify that filters are installed.
8. Adjust vibration isolators.
9. Inspect operation of barometric dampers.
10. Verify bearing lubrication on fan.
11. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
12. Adjust fan belts to proper alignment and tension.
13. Start unit according to manufacturer's written instructions.
14. Complete startup sheets and attach copy with Contractor's startup report.
15. Inspect and record performance of interlocks and protective devices; verify sequences.
16. Operate unit for an initial period as recommended or required by manufacturer.
17. Verify thermostat and humidistat calibration.
18. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
19. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.

3.6 CLEANING

A. Replace filters used during construction prior to air balance or substantial completion.

B. After completing installation of exposed, factory-finished water-source heat pumps, inspect exposed finishes and repair damaged finishes.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain water-source heat pumps. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 23 8239

CABINET UNIT HEATERS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the HVAC drawings:

1) Cabinet unit heaters with centrifugal fans and electric-resistance heating coils.
2) Propeller unit heaters with electric-resistance heating coils.
3) Contractor shall make final electrical connection for installed equipment.

B. Alternate Bid:

1. Contractor

a. Alternate Bid No. 1: Does not apply.
b. Alternate Bid No. 2: Does not apply.

1.2 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Plans, elevations, sections, and details.
2. Location and size of each field connection.
3. Details of anchorages and attachments to structure and to supported equipment.
4. Equipment schedules to include rated capacities, operating characteristics, furnished specialties, and accessories.
5. Location and arrangement of integral controls.
6. Wiring Diagrams: Power, signal, and control wiring.

C. Samples for Initial Selection: Finish colors for units with factory-applied color finishes selected by Architect.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 - PRODUCTS

2.1 CABINET UNIT HEATERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Airtherm; a Mestek Company.
2. Berko Electric Heating; a division of Marley Engineered Products.
3. Carrier Corporation.
4. Chromalox, Inc.; a division of Emerson Electric Company.
5. Dunham-Bush, Inc.
6. Engineered Air Ltd.
7. Indeeco.
8. International Environmental Corporation.
9. Markel Products; a division of TPI Corporation.
10. Marley Electric Heating; a division of Marley Engineered Products.
11. McQuay International.
12. Ouellet Canada Inc.
13. QMark Electric Heating; a division of Marley Engineered Products.
14. Rosemex Products.
15. Trane.
16. USA Coil & Air.

D. Description: A factory-assembled and -tested unit complying with ARI 440.

1. Comply with UL 2021.

E. Cabinet: Steel with baked-enamel finish with manufacturer's standard paint, in color selected by Architect.

1. Surface Mounted: Steel, finished to match cabinet.
2. Control Access Door: Tamper resistant cover.

F. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with fuses in terminal box for overcurrent protection and limit controls for high-temperature protection. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.

G. Fan and Motor Board: Removable.

1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.
2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

3. Wiring Terminations: Connect motor to chassis wiring with plug connection.

H. Control devices and operational sequences are specified in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls."

I. Basic Unit Controls:

1. Control voltage transformer.
2. Unit-mounted thermostat with the following features.

a. Heat-off switch.
b. Fan on-auto switch.

J. Electrical Connection: Factory wire motors and controls for a single field connection.

2.2 PROPELLER UNIT HEATERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Airtherm; a Mestek Company.
2. Engineered Air Ltd.
3. McQuay International.
4. Rosemex Products.
5. Ruffneck Heaters; a division of Lexa Corporation.
6. Trane.
7. Q-Mark.

C. Description: An assembly including casing, coil, fan, and motor in horizontal discharge configuration with adjustable discharge louvers.

D. Comply with UL 2021.

E. Discharge Louver: Adjustable fin diffuser for horizontal units and conical diffuser for vertical units.

F. Electric-Resistance Heating Elements: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch. Element ends shall be enclosed in terminal box. Fin surface temperature shall not exceed 550 deg F at any point during normal operation.

1. Circuit Protection: One-time fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters.
2. Wiring Terminations: Stainless-steel or corrosion-resistant material.

G. Fan: Propeller type with aluminum wheel directly mounted on motor shaft in the fan venturi.

H. Fan Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Motor Type: Permanently lubricated,.

I. Control Devices:

1. Wall-mounting thermostat.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for electrical connections to verify actual locations before unit heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall boxes in finished wall assembly; seal and weatherproof. Joint-sealant materials and applications are specified in Division 07 Section "Joint Sealants."

B. Install cabinet unit heaters to comply with NFPA 90A.

C. Install propeller unit heaters level and plumb.

D. Suspend propeller unit heaters from structure with all-thread hanger rods and elastomeric hangers. Hanger rods and attachments to structure are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Vibration hangers are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

3.3 CONNECTIONS

A. Comply with safety requirements in UL 1995.

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

Preliminary

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PROJECT MANUAL

CHAMPAIGN COUNTY
SATELLITE JAIL
JAIL CONSOLIDATION

ITB #2022-009 SATELITE JAIL CONSOLIDATION PROJECT

502 S. Lierman Ave.
Urbana, IL 61802

ISSUE FOR BIDS

VOLUME 4

REIFSTECK REID

DATE: SEPTEMBER 14, 2022

RRCo PROJECT #202190

PROJECT MANUAL FOR

CHAMPAIGN COUNTY SATELLITE JAIL
JAIL CONSOLIDATION
ITB #2022-009 SATELITE JAIL CONSOLIDATION PROJECT
502 S. Lierman Ave.
Urbana, IL 61802

DATE: SEPTEMBER 14, 2022 **ISSUE FOR BIDS**

VOLUME 1

VOLUME 2

VOLUME 3

VOLUME 4

MEP Specifier:
GHR Engineers & Associates Inc.
1615 S. Neil Street, Champaign, IL 61820
217.356.0536

SECTION 26 0500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Electrical equipment coordination and installation.
2) Common electrical installation requirements.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

PART 2 - PRODUCTS – DOES NOT APPLY

PART 3 - EXECUTION

3.1 INSPECTION OF BID DOCUMENTS AND PREMISES

A. Visit the premises, take measurements and verify all elevations shown on the drawings, inspect existing conditions and limitations, obtain first hand information necessary to submit a complete bid.

B. Thoroughly examine the complete set of contract documents including work required by other trades. Bidders are cautioned to acquaint themselves with requirements necessitating installation work of material or equipment furnished by other contractors or the Owner.

C. In the event of any conflict, discrepancy or inconsistency among the Contract Documents, interpretation shall be based on the following descending order or priority:

1. Specifications.
2. Drawings, and among the drawings, the following:

    a. as between figures given on drawings and scaled measurements, the figures shall govern;
    b. as between large scale drawings and small scale drawings, the large scale drawings shall govern.

3. In the event that Work is called for by the drawings but not by the specifications, or by the specifications but not by the drawings, the Contractor shall be responsible for such Work.

3.2 PERMITS AND FEES

A. Obtain and pay for all permits, and make all deposits necessary for the installation of the work under his contract.

B. Where inspections of the work are required by State or local authorities, obtain certificates of inspection of the work by such authorities, and these certificates (in triplicate) shall be submitted to the Architect / Engineer.

3.3 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Division 07 Section “Penetration Firestopping” for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

3.4 INTERRUPTION OF ELECTRICAL SYSTEMS AND SERVICES

A. Do not interrupt electric systems or service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect or Owner no fewer than seven days in advance of proposed interruption of electrical service. Indicate:

    a. The extent of the work to be done during the outage.

b. Probable length of time required for the outage.
c. Designed time at which the outage is to begin.

2. Do not proceed with interruption of electrical service without Architect's or Owner's written permission.
3. Schedule work to minimize the number and length of time of the outage(s) or interruption(s) of the various systems and services.

3.5 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Space Preference:

1. Carefully verify and coordinate the location and level of all lines. Run preliminary levels and check with all other contractors so that conflict in location may be avoided.
2. If conflicts occur, the following preference schedule shall be followed:

    a. Recessed electric fixtures.
    b. Sanitary drainage.
    c. Low pressure ductwork.
    d. Domestic water storm and vent lines.
    e. Electric conduits.

3. No other work shall have preference over plumbing lines below fixtures.
4. No other work shall have preference over conduit above or below electric switchgear and above or below panels.
5. No piping conveying fluids shall be provided directly over electrical or elevator equipment.

F. Lines and Levels: Determine all grades, maintain necessary lines and levels throughout the progress of the work and assume full responsibility for their correctness. Where levels are indicated on the drawings, work shall be installed at those levels unless prior written approval to change is obtained from the Architect / Engineer.

G. Location of Equipment: The approximate location of all equipment is shown on the drawings. The Architect / Engineer reserves the right to change the location of all equipment 5' in any direction without these changes being made the subject of an extra charge provided such changes are made before final installation.

3.6 ELECTRICAL DEMOLITION

A. Refer to Division 1 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.

B. Disconnect and remove electrical systems, equipment and components indicated to be removed.

1. Light Fixtures to be Removed: Remove light fixtures indicated to be removed along with associated, lamps, trim, supports and fixture whips.
2. Wiring Devices to be Removed: Remove wiring devices indicated to be removed along with associated cover plates.
3. Electrical Equipment to be Removed: Remove electrical equipment indicated to be removed along with associated supports, fittings, raceways and conductors.
4. Motors and Mechanical Equipment to be Removed: Electrically disconnect each motor and piece of mechanical equipment indicated to be removed and remove associated raceways, conduits, devices and electrical equipment.
5. Feeders and Branch Circuits to be Removed: Remove feeders and branch circuits indicated to be removed along with associated supports, fittings, raceway and conductors.

C. All removed electrical equipment, devices, raceways, conductors and associated items shall become property of the Contractor and shall be properly disposed of by the Contractor.

D. Fluorescent and HID lighting lamps and ballasts shall be removed from fixtures and disposed of as follows:

1. Fluorescent and HID lamps and ballasts shall be disposed of in strict adherence to waste Rule 35 III. Admin. Code Part 733.
2. After removal from fixture, lamps and ballasts shall be stored in a safe manner to minimize breakage.
3. Lamps and ballasts shall not be stored longer than six months form the time they are removed from service.
4. Lamps and ballasts shall be delivered to a licensed hauler to be delivered to a lamp and ballasts recycler.
5. Lamps and ballasts shall be transported in a safe manner to minimize breakage.
6. Disposal of lamps and ballasts shall be in accordance with all State and local codes.
7. Ballasts without factory label stating non-hazardous material shall be treated as a hazardous material and disposed of as stated above.

E. Removal of existing electrical devices shall be such that all existing remaining electrical devices are kept in continuous service.

F. Existing circuit conductors connected to outlets, boxes or fixtures being removed shall be disconnected and removed back to next active remaining device.

G. Existing circuit conductors connected to other fixtures, devices or other electrical equipment that are not to be removed or disconnected and are passing through outlet boxes, fixtures and conduit that are being removed; shall be rerouted from remaining existing device to next remaining device as necessary to keep remaining devices in service and existing circuit conductors continuous.

H. Where connections of existing devices cannot be made continuous with existing conduit, boxes and conductors; new raceways and conductors shall be installed from existing remaining device to next remaining device.

I. Disconnect and remove all devices, conduit, wiring, etc., in or on the walls, ceiling, etc., to be removed. Verify all occurrences not specifically shown or noted on plans.

J. For each item disconnected and removed, disconnect and remove defunct circuit wiring back to next active remaining device or to panel or switchboard from which the circuit originates.

K. For each item disconnected and removed, disconnect and remove abandoned, exposed conduits, and / or conduits made exposed by demolition, back to next active remaining device or to panel or switchboard from which the circuit originates.

L. All conditions shall be carefully field determined and verified.

M. Provide all abandoned ceiling outlets, switch boxes and outlet boxes with blank coverplates.

3.7 CUTTING AND PATCHING

A. Examine architectural and structural drawings to determine the general nature of the types of construction to be encountered during performance of electrical work.

B. All cutting and patching of masonry, carpentry, steel, iron work, concrete structural work, and finished surfaces belonging to the building shall be done in order that work may be properly installed. Replace or repair all disturbed constructions or finishes to its original condition and under no condition cut structural work except upon approval of the Architect / Engineer.

C. Cut through ceilings, floors, walls and partitions in a careful manner and fill the openings around the pipes and sleeves.

D. Carefully coordinate locations of openings and sleeves to avoid conflict with other trades. Furnish complete information concerning locations and sizes of openings to other trades in sufficient time for inclusion on their shop drawings.

E. Employ craftsmen and mechanics who are skilled and experienced in their respective trades to perform all cutting, fitting, matching, patch repairing, and finishing work required for installation of electrical work.

F. Perform cutting to neat line, in a manner that will not weaken the wall, partition, or floor being cut. Cut holes in floors to neat line. Perform drilling in a manner that will not cause breaking of floor around the drilled hole.

G. Patch, repair and unify all work and material that is cut.

3.8 OPENINGS IN EXISTING CONSTRUCTION

A. In existing construction, perform all cutting and patching where required in connection with the work. Match patching to existing adjacent surfaces.

B. All cutting in existing structural elements of building shall be accomplished with hole saws. Air hammers and cutting torches are not permitted.

C. Reinforced concrete slabs, steel joists, concrete floors and footings, or other structural work shall not be cut or disturbed in any way, unless as approved by the Architect / Engineer. The Contractor shall be held responsible for and correct all damage that he may cause.

D. Openings between conduit and floors or walls through fire or smoke barriers shall be closed with fire stop material to maintain fire or smoke barrier rating.

E. Fire stop material shall be Dow Corning 3-6548 Silicone RTV Foam, Chase Technology Corp. CTC PR-855 fire-resistant foam sealant, 3M CP-25 Series Caulk Fire Barrier, T & B S-101 Fire Barrier or Nelson Flameseal.

3.9 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping".

3.10 FIELD CORRECTIONS AND CHANGES

A. Carefully and accurately record on field set of drawings, any deviations or changes in locations of conduit, wiring and/or equipment made in the field and shall keep the Architect / Engineer informed on all deviations and changes.

B. At the completion of the job, furnish the Architect / Engineer three (3) complete sets (not the field set) of drawings indicating these deviations or changes. Extra sets of drawings will be provided to the contractor for this purpose. Any changes in the exterior work shall be recorded by dimension.

3.11 OPERATION AND MAINTENANCE INSTRUCTIONS

A. Before final acceptance of the electrical installation, provide to the Architect / Engineer three (3) bound copies of a complete set of operating and maintenance instructions and procedures for all electrical systems and equipment furnished under this contract.

B. Prepare a complete file of maintenance and operating instructions which covers all electrical systems and equipment listed in the section entitled "Submittals".

C. Data shall be placed in an 8-1/2" x 11" slide hinge, heavy duty, three-post type, stiff cover binder. Each completed binder shall not exceed 3-1/2" in thickness. Label binder as follows:

ELECTRICAL SYSTEMS
MAINTANENANCE AND OPERATING INSTRUCTIONS
CHAMPAIGN COUNTY JAIL CONSOLIDATION
URBANA, ILLINOIS

D. Data shall include a complete table of contents, tabs, final approved shop drawings, wiring diagrams, manufacturer's operating and maintenance instructions, catalog brochure information, replacement parts lists, name, address and telephone number of nearest stocking supply house.

E. Drawings shall be neatly folded to approximately 8-1/2" x 11" size and inserted individually into 8-1/2" x 11" sheet protectors which shall be properly punched and inserted into the binder.

F. All material relative to the equipment for one system (i.e.; lighting fixtures, panelboards, motor starting equipment, etc.) shall be filed behind a clearly labeled filing tab. The following

information shall be typed on the filing tab page: Item, Manufacturer, Contractor's Order Number, Supplier's Order Number, Manufacturer's Order Number.

G. Three completed files shall be submitted for review prior to job completion. Final payments will not be certified until the maintenance manuals have been received and reviewed.

H. Authorized manufacturer's personnel shall instruct (to the Owner's satisfaction) all personnel designated by the Owner in the use of equipment and systems as listed in the section entitled "Submittals".

I. Provide a minimum of two man days in two trips to the job before the job is accepted for the instruction and training of the Owner's representative in the operation and maintenance of the complete electrical system.

J. The above does not relieve the contractor of his responsibility of making service calls due to any defect which may develop with systems or equipment during the guarantee period nor shall these service calls be included as part of instruction time. Specific requirements in specifications for factor service representatives is also in addition to above requirements.

3.12 CLEANING UP

A. Before work can be considered complete, clean all surfaces of all paint, plaster, mortar, labels and other stains and remove all lumps of cement. Take care not to scratch, mar, or damaged surfaces in cleaning.

B. In case of dispute, the Owner / User may remove the rubbish and charge the cost to the one or more contractors as the Architect / Engineer may determine to be just.

3.13 TOUCH-UP PAINTING

A. Comply with requirements in Division 9 Painting Sections for cleaning and touch-up painting.

B. All factory applied paint finishes on all electrical items, equipment, panelboards, switchboards, fire alarm devices, etc., that is scratched or damaged shall be touched up with rust inhibitive paint to match factory applied paint.

END OF SECTION

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Building wires and cables rated 600 V and less.
2) Connectors, splices, and terminations rated 600 V and less.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 27 1323 – Communications Optical Fiber Backbone Cabling for 850 nanometer laser-optimized 50/125 micrometer multimode optical fiber cable (OM3), 9/125 micrometer single-mode, indoor-outdoor optical fiber cable (OS2), optical fiber cable connecting hardware, patch panels, and cross-connects, cabling identification products.
2. Section 27 1513 – Communications Copper Horizontal Cabling for Category 6a twisted pair cable., twisted pair cable hardware, including plugs and jacks, cabling identification products, grounding provisions for twisted pair cable.

1.3 DEFINITIONS

A. VFC: Variable frequency controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. General Cable; General Cable Corporation.
2. Senator Wire & Cable Company.
3. Southwire Company.
4. Nexans.
5. Republic Wire, Inc.

B. Aluminum and Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2.

2.2 CONNECTORS AND SPLICES

A. 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:

1. 3M.
2. Hubbell Power Systems, Inc.
3. ILSCO.
4. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

1. Expandable steel spring and polypropylene body type connectors and wire nuts for wire sizes up to an including No. 10 AWG.
2. Bolt type connectors or mechanical compression crimp type for wire sizes No. 8 AWG and larger. Cover connectors with three layers of 600 volt tape or heat shrinkable insulation equivalent to 150% conductor insulation.

2.3 SYSTEM DESCRIPTION

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.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

D. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

F. Branch Circuits Concealed below Slabs-on-Grade: Type THHN/THWN-2, single conductors in raceway.

G. Minimum wire size shall be No. 12 except for internal fixture wire which shall be minimum size of No. 14 type SF, SFF, PF, PFF or TFN, 600 volt.

H. All branch circuit wiring and feeder cables for circuits over 20 amps shall be sized as noted on the drawings. If size is not specifically noted, size all branch circuit wiring and feeder cables in accordance with the National Electrical Code.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 0529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical 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-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Splices and taps in conductors shall be as few in number as practicable.

D. Splices and taps shall be so made that they have an electrical resistance not in excess of that of 2’ of the conductor.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

E. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

F. Neutral conductors in outlet boxes at receptacles shall be jointed and pigtailed to the outlet. The removal of a receptacle from the circuit shall not affect the continuity of the neutral conductor.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIELD QUALITY CONTROL

A. Testing Agency: [**Owner will engage**] [**Engage**] a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

D. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Section includes grounding and bonding systems and equipment.
2) Section includes grounding and bonding systems and equipment plus the following special applications:

a) Underground distribution grounding.
b) Ground bonding common with lightning protection system.
c) Foundation steel electrodes.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 27 0526 – Grounding and Bonding for Communications Systems for grounding conductors, grounding connectors, grounding busbars, grounding labeling.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

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.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. Dossert; AFL Telecommunications LLC.
3. ERICO International Corporation.
4. Fushi Copperweld Inc.
5. Galvan Industries, Inc.; Electrical Products Division, LLC.
6. Harger Lightning & Grounding.
7. ILSCO.
8. O-Z/Gedney; a brand of Emerson Industrial Automation.
9. Robbins Lightning, Inc.
10. Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

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.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connections for Conductors and Pipes: Copper or copper alloy, pressure-type with at least two bolts.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor.

1. Bury at least 24 inches below grade.

C. Grounding Bus Bar: Install in electrical equipment rooms.

1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits. Separate grounding conductors are not shown on the drawings but shall be included in all raceways as set forth on the drawings.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Hangers and supports for electrical equipment and systems.
2) Construction requirements for concrete bases.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 27 0529 – Hangers and Supports for Communications Systems for steel slotted support systems for communication raceways, conduit and cable support devices, mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

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 the following:

    a. Hangers.
    b. Steel slotted support systems.
    c. Nonmetallic support systems.
    d. Trapeze hangers.
    e. Clamps.
    f. Turnbuckles.
    g. Sockets.
    h. Eye nuts.
    i. Saddles.
    j. Brackets.

2. Include rated capacities and furnished specialties and accessories.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4 factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Cooper B-Line, Inc.; a division of Cooper Industries.
    b. Flex-Strut Inc.
    c. Unistrut; an Atkore International company.

2. Material: Galvanized steel.

3. Channel Width: 1-5/8 inches.
4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Anchors using explosive charges to drive inserts into concrete shall not be used.
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti, Inc.
4) ITW Ramset/Red Head; Illinois Tool Works, Inc.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.

B. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.

3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners. Anchors using explosive charges to drive inserts into concrete shall not be used.
5. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69 or metal framing channel welded to structure.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Concrete bases to be 4” minimum thick unless otherwise called for on the drawings.

C. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete" or Division 03 Section "Miscellaneous Cast-in-Place Concrete".

D. Rough up floor to assure bonding of base to floor. Anchor the base to the floor with reinforcing bars set in the floor or power driven studs. Provide two layers 6 x 6 #6 welded wire reinforcing mesh in base.

E. Anchor equipment to concrete base as follows:

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

F. Provide concrete bases for the following floor mounted equipment:

1. Transformers.
2. Generators.
3. Transfer switches.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

C. Prime paint all structural steel installed for pipe or equipment supports or burned by welding with one coat of rust inhibitive black paint at the time of installation.

END OF SECTION

SECTION 26 0533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Metal conduits, tubing and fittings.
2) Nonmetal conduits, tubing and fittings.
3) Surface raceways.
4) Boxes, enclosures and cabinets.
5) Handholes and boxes for exterior underground cabling.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 26 0543 – Underground Ducts and Raceways for Electrical Systems for direct-buried conduit, ducts and duct accessories, concrete-encased conduit, ducts and duct accessories, handholes and boxes.
2. Section 27 0528 – Pathways for Communications Systems for metal conduits and fittings, nonmetallic conduits and fittings, metallic surface pathways, hooks, boxes, enclosures, and cabinets.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Tube & Conduit; a part of Atkore International.
2. Republic Conduit.
3. Western Tube and Conduit Corporation.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. EMT: Comply with ANSI C80.3 and UL 797.

E. FMC: Comply with UL 1; zinc-coated steel.

F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Fittings for EMT:

a. Material: Steel.
b. Type: Compression.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

H. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Tube and Conduit: A Part of Atkore International
2. CANTEX INC.
3. Electri-Flex Company.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. LFNC: Comply with UL 1660.

E. Continuous HDPE: Comply with UL 651B.

F. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.

G. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

H. Fittings for LFNC: Comply with UL 514B.

2.3 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hubbell Incorporated; Wiring Device-Kellems.
b. MonoSystems, Inc.
c. Panduit Corp.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Technologies Company.
2. Hubbell Incorporated.
3. MonoSystems, Inc.
4. RACO; Hubbell.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

G. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

H. Gangable boxes are prohibited.

I. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

J. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armorcast Products Company.
b. Carson Industries LLC.

c. NewBasis.
d. Oldcastle Precast, Inc.
e. Quazite: Hubbell Power Systems, Inc.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC.".

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
3. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage and Not Exposed to Inmates Not Accompanied by Jail Staff: EMT.
2. Exposed and Exposed to Inmates Not Accompanied by Jail Staff: GRC.
3. Surface raceways as noted on plan.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Concealed in pre-cast concrete walls: RNC, Type EPC-40-PVC.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
7. Damp or Wet Locations: GRC.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

    a. All boxes installed in poured concrete, block, brick or tile shall be masonry type.
    b. All multiple gang switch boxes shall be solid gang box.
    c. All surface-mounted boxes shall be cast FS or FD type.
    d. The minimum size of boxes shall be 4” x 4” x 2-1/8” minimum depth. For single device installation, install square cut single device cover.
    e. Install all device boxes with square cut device covers for number of devices required.
    f. For multiple gang boxes installed for more than one 277 volt switch, a barrier shall be installed between each box gang.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.

3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install surface raceways only where indicated on Drawings.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Conduits and raceways shall not be supported from plumbing lines, ductwork or supports for equipment provided by other trades.

F. Arrange stub-ups so curved portions of bends are not visible above finished slab.

G. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

H. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines. In mechanical equipment rooms conduit and EMT may be exposed at the ceiling or on the walls.

I. Support conduit within 12 inches of enclosures to which attached.

J. Raceways Embedded in Slabs:

1. There shall not be any raceways installed horizontally in concrete slabs throughout the building, except where specifically noted and detailed on the drawings.
2. Conduits shall be permitted to be installed below slabs-on-grade.

K. Stub-ups to Above Recessed Ceilings:

1. Use EMT for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

L. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

M. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

N. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

P. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

Q. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

R. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

S. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

T. Surface Raceways:

1. Install surface raceway with a minimum 2-inchradius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel. Boxes shall be separated by 24”, horizontally at a minimum.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

B. Protect work from injury by keeping all conduit and boxes capped and plugged or otherwise protected. This includes damage by freezing and / or stoppage from building materials, sand, dirt or concrete.

END OF SECTION

SECTION 26 0543

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Direct-buried conduit, ducts, and duct accessories.
2) Concrete-encased conduit, ducts, and duct accessories.
3) Handholes and boxes.

B. Alternate Bids:

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 26 0533 – Raceways and Boxes for Electrical Systems for metal conduits, tubing and fittings, nonmetal conduits, tubing and fittings, surface raceways, boxes, enclosures and cabinets, handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include duct-bank materials, including separators and miscellaneous components.
2. Include ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Include warning tape.

1.5 FIELD CONDITIONS

A. Ground Water: Assume ground-water level is 36 inches below ground surface unless a higher water table is noted on Drawings.

B. Location of Existing Buried Utilities: The contract documents do not claim to show all existing buried utilities on site.

1. Contact JULIE (Joint Utility Location Information for Excavators) at 800-892-0123 at least two business days prior to any digging, excavation or boring.
2. Provide services of a private locating service to identify and locate all existing utilities that could be affected by excavation and new work. Locate privately owned utilities, the Owner's utilities and all utilities that do not participate in the JULIE program.
3. Repair all damage caused by the Contractor's activities promptly to the satisfaction of the Owner of the damaged utility. All such repairs shall be conducted at the sole expense of the Contractor that damaged the utility.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DUCTS AND RACEWAYS

A. Comply with ANSI C2.

2.2 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-40-PVC and Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.3 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Tube and Conduit: A Part of Altkove International
2. CANTEX INC.
3. ElecSys, Inc.

B. Underground Plastic Utilities Duct: NEMA TC 2, UL 651, ASTM F 512, Type EPC-80 and Type EPC-40, with matching fittings complying with NEMA TC 3 by same manufacturer as the duct.

C. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."

2.4 PRECAST CONCRETE HANDHOLES AND BOXES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Christy Concrete Products.
2. Oldcastle Precast, Inc.
3. Rinker Group, Ltd.
4. Utility Concrete Products, LLC.

B. Comply with ASTM C 858 for design and manufacturing processes.

C. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.

1. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
2. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
3. Cover Legend: Molded lettering, "ELECTRIC."
4. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
5. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
6. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

    a. Type and size shall match fittings to duct or conduit to be terminated.
    b. Fittings shall align with elevations of approaching ducts and be located near interior corners of handholes to facilitate racking of cable.

2.5 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. General Requirements for Handholes and Boxes: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

1. Color: Green.
2. Configuration: Units shall be designed for flush burial and have open [**integral closed**] bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, As indicated for each service.
6. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

7. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

B. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. NewBasis.
d. Olcastle Precast, Inc.
e. Quazite: Hubbell Power Systems, Inc.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

C. Clear and grub vegetation to be removed, and protect vegetation to remain according to Section 311000 "Site Clearing." Remove and stockpile topsoil for reapplication according to Section 311000 "Site Clearing."

3.2 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

3.3 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less:

1. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
2. Units Subject to Light-Duty Pedestrian Traffic Only: ANSI77 TIER 15 structural loading rating.

3.4 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.

D. Cut and patch existing pavement in the path of underground ducts and utility structures.

3.5 DUCT INSTALLATION

A. Install ducts according to NEMA TCB 2.

B. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions.

C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches, both horizontally and vertically, at other locations unless otherwise indicated.

D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

E. Duct Entrances to Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
2. Grout end bells into structure walls from both sides to provide watertight entrances.

F. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall, without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

G. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

H. Pulling Cord: Install 100-lbf-test nylon cord in empty ducts.

I. Concrete-Encased Ducts: Support ducts on duct separators.

1. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes less than 6 inches in nominal diameter.

2. Width: Excavate trench 3 inches wider than duct bank on each side.
3. Depth: Install top of duct bank at least 24 inches below finished grade in areas not subject to deliberate traffic, and at least 30 inches below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
4. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
5. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
6. Elbows: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
    b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.

7. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
8. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
9. Concrete Cover: Install a minimum of 3 inches of concrete cover at top and bottom, and a minimum of 2 inches on each side of duct bank.
10. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

    a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
    b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing-rod dowels extending a minimum of 18 inches into concrete on both sides of joint near corners of envelope.

11. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

J. Direct-Buried Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct bank. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches in nominal diameter.
2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
3. Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and

contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.

4. Depth: Install top of duct bank at least 36 inches below finished grade unless otherwise indicated.
5. Set elevation of bottom of duct bank below frost line.
6. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
7. Elbows: Install manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
8. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
    b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

9. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.

    a. Place minimum 3 inches of sand as a bed for duct bank. Place sand to a minimum of 6 inches above top level of duct bank.
    b. Place minimum 6 inches of engineered fill above concrete encasement of duct bank.

K. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.6 INSTALLATION OF CONCRETE HANDHOLE

A. Precast Concrete Handhole Installation:

1. Comply with ASTM C 891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:

1. Install handholes with bottom below frost line, 36” frost line below grade at Project site. below grade.

2. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch above finished grade.
3. Where indicated, cast handhole cover frame integrally with handhole structure.

3.7 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.

D. Install handholes and boxes with bottom below frost line, 36” of frost line below grade at Project site below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

F. Field cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.8 GROUNDING

A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.9 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION

SECTION 26 0544

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2) Sleeve-seal fittings.
3) Grout.
4) Silicone sealants.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 07 8413 – Penetration Firestopping for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.
2. Section 27 0544 – Sleeves and Sleeve Seals for Communications Pathways and cabling for round sleeves, sleeve seal systems, grout, foam sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Advance Products & Systems, Inc. – Innerlynx.
   b. Metraflex Company. – Metra Seal.
   c. Pipeline Seal and Insulator, Inc. – Link Seal

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.4 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
2. Sealant shall have VOC content of **<Insert value>** g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Sealant 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."

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using silicone sealant appropriate for size, depth, and location of joint.
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
4. Install sleeves for all wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve-seal system.

G. Sleeves for Conduits Penetrating Above-Grade Fire-Rated Walls:

1. Interior Penetrations of Fire-Rated Walls and Floors:

   a. Seal annular space between sleeve and raceway or cable, using appropriate fire stop material such as 3M fire barrier CD 24WB+ or similar appropriate for size, depth, and location of joint.
   b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed[**or unless seismic criteria require different clearance**].
4. Install sleeves for all wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors [**2 inches**] **<Insert dimension>** above finished floor level. Install sleeves during erection of floors.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION

SECTION 26 0548

VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Elastomeric isolation pads.
2) Restraints - rigid type.
3) Restraints - cable type.
4) Restraint accessories.
5) Post-installed concrete anchors.
6) Concrete inserts.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 26 0010 – Supplemental Requirements for Electrical for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 26 0011 – Facility Performance Requirements for Electrical for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.

3. Section 26 0529 – Hangers and Supports for Electrical Systems for commonly used electrical supports and installation requirements.

1.3 DEFINITIONS

A. OSHPD: Office of Statewide Health Planning and Development (for the State of California owned and regulated medical facilities).

1.4 ACTION SUBMITTALS

A. Product Data:

1. Elastomeric isolation pads.
2. Restraints - rigid type.
3. Restraints - cable type.
4. Restraint accessories.
5. Post-installed concrete anchors.
6. Concrete inserts.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
3. Show coordination of seismic and wind-load bracing for components with other systems and equipment in the vicinity, including other supports and seismic restraints.

C. Delegated Design Submittal for Each Seismic-Restraint Device: Signed and sealed by qualified structural professional engineer.

1. For each seismic-restraint device that is required by this Section, submit the following:

   a. Seismic Restraints: Select seismic restraints complying with performance requirements, design criteria, and analysis data.
   b. Post-Installed Concrete Anchors and Inserts: Include calculations showing anticipated seismic loads. Include certification that device is approved by qualified testing laboratory for seismic reinforcement use.
   c. Seismic Design Calculations: Submit input data and loading calculations prepared in accordance with criteria specified in Section 260010 "Supplemental Requirements for Electrical" and Section 260011 "Facility Performance Requirements for Electrical."

2. Seismic-Restraint Detail Drawings: Signed and sealed by qualified structural professional engineer.

   a. Design Analysis: To support selection and arrangement of seismic and wind-load restraints. Include calculations of combined tensile and shear loads.
   b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.

3. Product Listing, Preapproval and Evaluation Documentation: By UL, OSHPD or an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer and testing agency.

B. Field quality-control reports.

C. Seismic Qualification Data: Provide special certification for designated seismic systems as indicated in [**ASCE/SEI 7-05,**] [**ASCE/SEI 7-10,**] [**ASCE/SEI 7-16,**] Paragraph 13.2.2, "Special Certification Requirements for Designated Seismic Systems" for all Designated Seismic Systems identified as such on Drawings or in the Specifications.

1. Provide equipment manufacturer's written certification for each designated active mechanical seismic device and system, stating that it will remain operable following the design earthquake.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For seismic restraints to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct testing indicated, be an NRTL as defined by OSHA in 29 CFR 1910.7, and be acceptable to authorities having jurisdiction.

B. Seismic-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: ICC-ES product listing, UL product listing or an agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage qualified structural professional engineer to design seismic-load control system.

B. Seismic Design Calculations:

1. Perform calculations to obtain force information necessary to properly select seismic-restraint devices, fasteners, and anchorage. Perform calculations using methods acceptable to applicable code authorities and as presented in [**ASCE/SEI 7-05**] [**ASCE/SEI 7-10 including supplement No. 1**] [**ASCE/SEI 7-16**]. Where "ASCE/SEI 7" is

used throughout this Section, it is to be understood that the edition referred to in this subparagraph is the edition intended as reference throughout the Section Text.

a. Data indicated below to be determined by Delegated Design Contractor must be obtained by Contractor and must be included in individual component submittal packages.
b. Building Occupancy Category: [**I**] **[II]** [**III**] [**IV**].
c. Building Risk Category: [**I**] [**II**] [**III**] [**IV**].
d. Building Site Classification: [**A**] [**B**] [**C**] [**D**] [**E**] [**F**].
e. Seismic Design Category: [**A**] [**B**] [**C**] [**D**] [**E**] [**F**].

C. Seismic-Load-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: UL product listing or an agency acceptable to authorities having jurisdiction.

D. Consequential Damage: Provide additional seismic and wind-load restraints for suspended components or anchorage of floor-, roof-, or wall-mounted components so that failure of a non-essential or essential component will not cause failure of any other essential building component.

E. Fire/Smoke Resistance: Seismic- and wind-load-restraint devices that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by qualified testing laboratory in accordance with ASTM E84 or UL 723, and be so labeled.

F. Component Supports:

1. Load ratings, features, and applications of reinforcement components must be based on testing standards of qualified testing laboratory.
2. All component support attachments must comply with force and displacement resistance requirements of [**ASCE 7-05 Section 13.6**] [**ASCE/SEI 7-10 Section 13.6**] [**ASCE/SEI 7-16 Section 13.6**].

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads: .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kinetics Noise Control, Inc.
b. Mason Industries, Inc.

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties. Neoprene rubber, silicone rubber, or other elastomeric material.
5. Surface Pattern: Smooth, ribbed, or waffle pattern.

2.3 RESTRAINTS - RIGID TYPE

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

B. Description: Shop- or field-fabricated bracing assembly made of ANSI/AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.4 RESTRAINTS - CABLE TYPE

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

B. Seismic- and Wind-Load-Restraint Cables: ASTM A1023/A1023M galvanized or ASTM A603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic-restraining cable service; with fittings attached by means of poured socket, swaged socket, or mechanical (Flemish eye) loop.

C. Restraint cable assembly and cable fittings must comply with ASCE/SEI 19. Cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.5 RESTRAINT ACCESSORIES

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kinetics Noise Control, Inc.
    b. Mason Industries, Inc.

B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Non-metallic stiffeners are unacceptable.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.6 POST-INSTALLED CONCRETE ANCHORS

A. Mechanical Anchor Bolts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.

2. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength for anchor and as tested according to ASTM E488/E488M.

B. Adhesive Anchor Bolts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.

2. Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.

C. Provide post-installed concrete anchors that have been prequalified for use in seismic and wind-load applications.

1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.

D. Expansion-type anchor bolts are not permitted for equipment in excess of 10 hp that is not vibration isolated.

1. Undercut expansion anchors are permitted.

2.7 CONCRETE INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.

B. Provide preset concrete inserts that are seismically prequalified in accordance with ICC-ES AC446 testing.

C. Comply with MSS SP-58.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive seismic and wind-load control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by OSHPD or an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry static, wind load, and seismic loads within specified loading limits.

3.3 INSTALLATION OF SEISMIC-RESTRAINT CONTROL DEVICES

A. Provide seismic restraint and wind-load control devices for systems and equipment where indicated in Equipment Schedules or Seismic and Wind-Load Controls Schedule, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.

1. Install equipment and devices to withstand the effects of earthquake motions and high wind events.

B. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

C. Installation of seismic and wind-load restraints must not cause any stresses, misalignment, or change of position of equipment or conduits.

D. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.

2. Install seismic-restraint and wind-load-restraint devices using methods approved by OSHPD or an agency acceptable to authorities having jurisdiction that provides required submittals for component.

E. Raceway, Cable, Wireway, Cable Tray, and Busway Support and Hanger Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint and wind-load-restraint devices using methods approved by OSHPD or an agency acceptable to authorities having jurisdiction that provides required submittals for component.
3. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
4. Install seismic-restraint devices using methods approved by OSHPD or an agency acceptable to authorities having jurisdiction providing required submittals for component.

F. Install cables so they do not bend across edges of adjacent equipment or building structure.

G. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

H. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

I. Post-Installed Concrete Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors must be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive-Type Anchor Bolts: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Field tests must be witnessed by Architect.

B. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test no fewer than four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.

C. Nonconforming Work:

1. Seismic controls will be considered defective if they do not pass tests and inspections.
2. Remove and replace malfunctioning units and retest as specified above.

D. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

END OF SECTION

SECTION 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Identification for raceways.
2) Identification of power and control cables.
3) Identification for conductors.
4) Underground-line warning tape.
5) Warning labels and signs.
6) Instruction signs.
7) Equipment identification labels, including arc-flash warning labels.
8) Miscellaneous identification products.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 27 0553 – Identification for Communications Systems for color and legend requirements for labels and signs, labels, signs, fasteners for labels and signs.

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 electrical identification products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.

C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

2.3 LABELS

A. Self-Adhesive Labels:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. A'n D Cable Products.
b. Brady Corporation.
c. Brother International Corporation.
d. emedco.
e. Grafoplast Wire Markers.
f. Ideal Industries, Inc.
g. LEM Products Inc.
h. Marking Services, Inc.
i. Panduit Corp.

2. Preprinted, 3-mil-thick, vinyl flexible label with acrylic pressure-sensitive adhesive.

    a. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized to fit the cable or raceway diameter, such that the clear shield overlaps the entire printed legend.

2.4 TAPES AND STENCILS:

A. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Brady Corporation.
    b. Carlton Industries, LP.
    c. emedco.

B. Underground-Line Warning Tape

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Brady Corporation.
    b. Ideal Industries, Inc.
    c. LEM Products Inc.
    d. Marking Services, Inc.
    e. Reef Industries, Inc.

2. Tape:

    a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
    b. Printing on tape shall be permanent and shall not be damaged by burial operations.
    c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

3. Color and Printing:

    a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
    b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE" <**Insert inscription**>.
    c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE" <**Insert inscription**>.

4. Tape Construction:

    a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.

b. Width: 3 inches.
c. Overall Thickness: 5 mils.
d. Foil Core Thickness: 0.35 mil.
e. Tensile according to ASTM D 882: 70 lbf and 4600 psi.

2.5 SIGNS

A. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

a. For signs up to 20 sq. inches, minimum 1/16-inch-.
b. For signs larger than 20 sq. inches, 1/8 inch thick.
c. Engraved legend with white letters on a dark grey background.
d. Punched or drilled for mechanical fasteners.
e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Carlton Industries, LP.
c. emedco.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

G. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

H. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

I. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

3.3 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive vinyl label or self-adhesive vinyl tape applied in bands. Install labels at 10-foot maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels containing the wiring system legend and system voltage. System legends shall be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "FIRE ALARM."
4. “SECURITY”.
5. “DATA”.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

    a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
    b. Colors for 208/120-V Circuits:

        1) Phase A: Black.
        2) Phase B: Red.

3) Phase C: Blue.
4) Neutral: White.
5) Ground: Green.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.
4) Neutral: White.
5) Ground: Green with yellow stripe.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

1. Install underground-line warning tape for direct-buried cables and cables in raceways.

E. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Engraved, laminated acrylic or melamine plastic label, punched or drilled for mechanical fasteners. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
d. Fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
e. Attach labels with screws and not adhesives.

2. Equipment To Be Labeled:

a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a engraved, laminated acrylic or melamine label.
b. Enclosures and electrical cabinets.
c. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
d. Enclosed switches.
e. Enclosed circuit breakers.
f. Enclosed controllers.
g. Variable-speed controllers.
h. Power-transfer equipment.

i. Power-generating units.

END OF SECTION

SECTION 26 0923

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Indoor occupancy and vacancy sensors.
2) Low-voltage wall stations.
3) Switchbox-mounted occupancy sensors.
4) Emergency shunt relays.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 26 2726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

B. Installed but furnished by others:

1. Relays for controlling light fixtures controlled by the detention security control system shall be furnished and installed by the electronic security system integrator.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Show installation details for the following:

a. Occupancy sensors.
b. Vacancy sensors.
c. Power packs.
d. Low-voltage switches.

2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of lighting control devices.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCYAND VACANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Sensor Switch, Inc.
2. Hubbell Building Automation, Inc.
3. Philips.

B. General Requirements for Sensors:

1. Wall or Ceiling-mounted as shown on drawings, solid-state indoor occupancy or vacancy sensors.
2. Dual technology.
3. Integrated or separate power pack as needed to meet lighting control sequence.
4. Hardwired connection to switch.
5. Configured for one-pole operation.

6. Operation:

    a. Combination Sensor: Unless otherwise indicated, sensor shall be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

7. Furnish with auxiliary dry contact closure via an SPDT, 1 amp, 40 volt relay.
8. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A or sensor is powered from the power pack whichever best meets lighting control sequences.
9. Power Pack: Dry contacts rated for 20-A load at 120- and 277-V ac, and for 1 hp at 120-V ac.
10. 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.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
12. Bypass Switch: Override the "on" function in case of sensor failure.

C. Dual-Technology Type: Wall or ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Standard Range Detection Coverage: Detect occupancy anywhere within a circular area of 500 sq. ft. when mounted on a 96-inch-high ceiling.
4. Extended Range Detection Coverage: Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch high ceiling.
5. Wall Mount Sensor Detection Coverage: Detect occupancy anywhere within a 90-degree pattern centered on the sensor over an area of 1000 square feet when mounted 96 inches above finished floor.

2.2 LOW-VOLTAGE WALL STATIONS

A. Manufacturers

1. Sensor Switch, Inc.
2. Hubbell Building Automation, Inc.
3. Philips.

B. General Requirements for low-voltage wall stations: Push-Button type low-voltage wall stations shall interface with standard occupancy sensor systems and power packs in order to implement a wide range of single, bi-level and dimmable switching applications.

1. Enables occupancy sensors system to be used for manual on operation.
2. Alternative usage as override switch for auto-on applications.
3. Soft-click push-buttons with engraved identification
4. Programmable on site
5. Hard wired
6. Color: White
7. Faceplate Color: Color to match switch.
8. Available with one or more of the following options (see schedule on plans for individual switch requirements)

    a. Two-pole, dual manual on operation
    b. Three-way operation
    c. 0-10 VDC dimming control

2.3 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Sensor Switch, Inc.
2. Hubbell Building Automation, Inc.
3. Philips.

B. General Requirements for Sensors: Automatic-wall-switch sensor with manual on-off switch, suitable for mounting in a single gang switchbox using hardwired connection.

1. Auto-On Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
2. Manual-On Sensor Operation: Unless otherwise indicated, requires manual action to turn lights on, but no action to turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
4. Switch Rating: Not less than 800-VA load at 120 V, 1200-VA load at 277 V.
5. Configured for one-pole operation.
6. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 500 sq. ft.
7. Sensing Technology: Dual technology - PIR and ultrasonic.
8. Capable of controlling load in three-way application.
9. Voltage: Dual voltage - 120 and 277 V.
10. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
11. Color: White.
12. Faceplate: Color matched to switch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SENSOR INSTALLATION

A. Comply with NECA 1.

B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

C. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.3 WIRING INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Comply with Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables." Install all lighting control wiring in conduit. Minimum conduit size is 1/2 inch.

C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Lighting control devices will be considered defective if they do not pass tests and inspections.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to three visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION

SECTION 26 2213

LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Section includes distribution, dry-type transformers with a nominal primary and secondary rating of 600 V and less, with capacities up to 1500 kVA.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 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 and size of transformer.
2. Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer.

B. Shop Drawings:

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.

3. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for transformers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
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.
4. Certification: Indicate that equipment meets Project seismic requirements.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inspection: On receipt, inspect for and note any shipping damage to packaging and transformer.

1. If manufacturer packaging is removed for inspection, and transformer will be stored after inspection, re-package transformer using original or new packaging materials that provide protection equivalent to manufacturer's packaging.

B. Storage: Store in a warm, dry, and temperature-stable location in original shipping packaging.

C. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

D. Handling: Follow manufacturer's instructions for lifting and transporting transformers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. Siemens Power Transmission & Distribution, Inc.
4. Square D; by Schneider Electric.

B. Source Limitations: Obtain each transformer type from single source from single manufacturer.

C. Obtain low voltage transformer from the same manufacturer as:

1. Fusible and non-fusible switches.
2. Molded case circuit breakers.
3. Enclosed controllers.
4. Distribution panelboards.
5. Branch circuit panelboards.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Transformers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the transformer will remain in place without separation of any parts when subjected to the seismic forces specified and the transformer will be fully operational after the seismic event."

2.3 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Comply with NFPA 70.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

C. Transformers Rated 15 kVA and Larger:

1. Comply with 10 CFR 431 (DOE 2016) efficiency levels.
2. Marked as compliant with DOE 2016 efficiency levels by an NRTL.

2.4 DISTRIBUTION TRANSFORMERS

A. Comply with NFPA 70.

B. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.

1. One leg per phase.
2. Grounded to enclosure.

C. Coils: Continuous windings without splices except for taps.

1. Coil Material: Aluminum.
2. Internal Coil Connections: Brazed or pressure type.
3. Terminal Connections: Bolted.

D. Enclosure: Ventilated.

1. NEMA 250, Type 2: Core and coil shall be encapsulated within resin compound to seal out moisture and air.
2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.
3. Wiring Compartment: Sized for conduit entry and wiring installation.

4. Finish: Comply with NEMA 250.

a. Finish Color: Gray weather-resistant enamel.

E. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

F. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.

G. Grounding: Provide ground-bar kit or a ground bar installed on the inside of the transformer enclosure.

2.5 IDENTIFICATION

A. Nameplates: Engraved, laminated-acrylic signs for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 26 0553 "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 26 0526 "Grounding and Bonding for Electrical Systems" have been met.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install transformers level and plumb on a concrete base with vibration-dampening supports. Locate transformers away from corners and not parallel to adjacent wall surface.

B. Construct concrete bases according to Section 03 3000 "Cast-in-Place Concrete" and anchor floor-mounted transformers according to manufacturer's written instructions, seismic codes applicable to Project, and requirements in Section 26 0529 "Hangers and Supports for Electrical Systems."

1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

C. Secure transformer to concrete base according to manufacturer's written instructions.

D. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.

E. Remove shipping bolts, blocking, and wedges.

3.3 CONNECTIONS

A. Ground equipment according to Section 26 0526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

C. Tighten electrical 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-486B.

D. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Small (Up to 167-kVA Single-Phase or 500-kVA Three-Phase) Dry-Type Transformer Field Tests:

1. Visual and Mechanical Inspection.

    a. Inspect physical and mechanical condition.
    b. Inspect anchorage, alignment, and grounding.
    c. Verify that resilient mounts are free and that any shipping brackets have been removed.
    d. Verify the unit is clean.
    e. Perform specific inspections and mechanical tests recommended by manufacturer.
    f. Verify that as-left tap connections are as specified.
    g. Verify the presence of surge arresters and that their ratings are as specified.

3.5 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION

SECTION 26 2416

PANELBOARDS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Section Distribution panelboards.
2) Lighting and appliance branch-circuit panelboards.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. GFEP: Ground-fault equipment protection.

D. HID: High-intensity discharge.

E. MCCB: Molded-case circuit breaker.

F. SPD: Surge protective device.

G. VPR: Voltage protection rating.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of NRTL listing for SPD as installed in panelboard.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.4 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

B. Source Limitations:

1. Obtain panelboards, overcurrent protective devices, components and accessories through one source from a single manufacturer.

a. Fusible and non-fusible switches.
b. Molded case circuit breakers.
c. Enclosed controllers.
d. Low voltage transformers.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.8 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards 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.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
    b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect and Owner no fewer than two days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Architect's or Owner's written permission.
3. Comply with NFPA 70E.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.

1. SPD Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. 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.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

F. Enclosures: Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

    a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

2. Height: 84 inches maximum.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
4. Finishes:

    a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    b. Back Boxes: Galvanized steel.
    c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

G. Incoming Mains:

1. Location: Convertible between top and bottom.
2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

H. Phase, Neutral, and Ground Buses:

1. Material: Tin-plated aluminum.

    a. Plating shall run entire length of bus.
    b. Bus shall be fully rated the entire length.

2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.

I. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Tin-plated aluminum.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.

J. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

1. Future Space Capacity: As shown on drawings.

K. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. 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."
2. Seismic requirements apply to panelboards on emergency power system only.

B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens.
4. Square D.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 POWER PANELBOARDS (DISTRIBUTION PANELBOARDS)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens Energy.
4. Square D.

B. Panelboards: NEMA PB 1, distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: Lugs only.

E. Branch Overcurrent Protective Devices: Bolt-on circuit breakers.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens.
4. Square D.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
3. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Breaker handle indicates tripped status.
c. UL listed for reverse connection without restrictive line or load ratings.

d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

2.6 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

C. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.7 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment,

raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NEMA PB 1.1.

D. Equipment Mounting:

1. Attach panelboard to the vertical finished or structural surface behind the panelboard.
2. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."

E. Mount top of trim 90 inches above finished floor unless otherwise indicated.

F. Mount panelboard cabinet plumb and rigid without distortion of box.

G. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

H. Mount surface-mounted panelboards to steel slotted supports 1 1/4 inch in depth. Orient steel slotted supports vertically.

I. Install overcurrent protective devices not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.
2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

J. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

K. Install filler plates in unused spaces.

L. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 GROUND FAULT INTERRUPTING PROTECTION

A. Provide ground fault interrupting type circuit protection for the following equipment:

1. Hydrotherapy and hydro massage tubs.
2. Service outlets within 25’ of HVAC and refrigeration equipment.
3. Light fixtures and paddle fans located less than five feet horizontally and welve feet vertically form highest water level of pool, spa or hot tub.
4. Temporary power.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 Circuit Breakers and Paragraph 7.19.1 Surge Arrestors, Low-Voltage. Perform optional tests. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

3.7 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

SECTION 26 2726

WIRING DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Straight-blade convenience, hospital-grade, isolated-ground, and tamper-resistant receptacles.
2) GFCI receptacles.
3) Toggle switches.
4) Wall-box dimmers.
5) Wall plates.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 DEFINITIONS

A. Abbreviations of Manufacturers' Names:

1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
3. Leviton: Leviton Mfg. Company, Inc.
4. Pass & Seymour: Pass& Seymour/Legrand.

B. BAS: Building automation system.

C. EMI: Electromagnetic interference.

D. GFCI: Ground-fault circuit interrupter.

E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

F. RFI: Radio-frequency interference.

G. SPD: Surge protective device.

H. UTP: Unshielded twisted pair.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STRAIGHT-BLADE RECEPTACLES

A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Eaton (Arrow Hart).
   b. Hubbell Incorporated; Wiring Device-Kellems.
   c. Leviton Manufacturing Co., Inc.
   d. Pass & Seymour/Legrand (Pass & Seymour).

B. Tamper-Resistant Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Eaton (Arrow Hart).
    b. Hubbell Incorporated; Wiring Device-Kellems.
    c. Leviton Manufacturing Co., Inc.
    d. Pass & Seymour/Legrand (Pass & Seymour).

2. Description: Labeled and complying with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

2.3 GFCI RECEPTACLES

A. General Description:

1. 125 V, 20 A, straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Eaton (Arrow Hart).
    b. Hubbell Incorporated; Wiring Device-Kellems.
    c. Leviton Manufacturing Co., Inc.
    d. Pass & Seymour/Legrand (Pass & Seymour).

C. Tamper-Resistant, Duplex GFCI Convenience Receptacles:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Hubbell Incorporated; Wiring Device-Kellems.
    b. Pass & Seymour/Legrand (Pass & Seymour).

2.4 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Single Pole:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Eaton (Arrow Hart).
        2) Hubbell Incorporated; Wiring Device-Kellems.
        3) Leviton Manufacturing Co., Inc.

4) Pass & Seymour/Legrand (Pass & Seymour).

2. Two Pole:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Eaton (Arrow Hart).
2) Hubbell Incorporated; Wiring Device-Kellems.
3) Leviton Manufacturing Co., Inc.
4) Pass & Seymour/Legrand (Pass & Seymour).

2.5 WALL PLATES

A. Single, multi gang and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch-thick, satin-finished, Type 302 stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.6 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.

B. The Architect / Engineer reserves the right to change the color at time of shop drawing review.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Mounting Heights

1. Examine architectural details and elevations for heights indicated there. Coordinate mounting heights with wall treatment and finish.
2. Examine electrical drawings for heights indicated there.
3. Unless otherwise indicated:

a. Wall Switches: 48" above finished floor, except where special wall treatment requires a higher or lower setting.

b. Dimmer and Lighting Controls: 48" AFF, except where special wall treatment requires higher or lower setting.
c. Receptacles - General: 18" AFF.
d. Receptacles in Mechanical and Electrical Equipment Rooms: 40" AFF.
e. Receptacles - Exterior: 24" above finished grade.

4. Mounting heights given above shall be to the center line of the device.
5. In block walls, locate device in either bottom or top of the block course nearest to the height indicated.
6. Where receptacles are indicated to be installed above counters, mount in the horizontal position 4" from top of back splash to bottom of box.

C. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

D. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

E. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

F. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

G. Device Plates: Device plates shall fit tight against the finished walls and shall completely cover the openings in the walls for the boxes. Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening. Device plates shall be attached and adjusted so they finish straight and level.

H. Dimmers:

1. Install dimmers within terms of their listing.
2. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

I. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 GROUND FAULT INTERRUTING RECEPTACLES

A. Where drawing or specifications call for 15 amp or 20 amp, 120 volt receptacles in the following locations, provide ground fault interrupting type receptacles.

1. Bathrooms, Restrooms and Toilet Rooms.
2. Wet locations.
3. Outdoors.
4. Rooftops.
5. Within five feet of sink or lavatory.

3.4 IDENTIFICATION

A. Comply with Section 26 0553 "Identification for Electrical Systems."

1. Receptacles and Switches: Provide all outlet and switch coverplates with identification labels showing panelboard designation and circuit breaker number connected to device.

a. Normal Circuits: Black letters indicating panel and circuit number on clear background applied to front of coverplate. Minimum letter height 3/16”.
b. Emergency Circuits: Red letter indicating panel and circuit number on clear background applied to front of coverplate. Minimum letter height 3/16”.

2. Labels shall be attached to coverplates with pressure-sensitive adhesive. Devices installed in multi-outlet, surface raceways shall be provided with labels.

END OF SECTION

SECTION 26 2813

FUSES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Cartridge fuses rated 600 V ac and less for use in the following:

a) Panelboards.
b) Enclosed controllers.
c) Enclosed switches.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Coordination charts and tables and related data.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data.

1.4 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. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.5 FIELD CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bussmann, an Eaton business.
2. Edison; a brand of Bussmann by Eaton.
3. Littelfuse, Inc.
4. Mersen USA.

B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC, time delay.

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.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Feeders, up to 600 Amp: Class RK1, time delay.
2. Motor Branch Circuits: Class RK1, time delay.
3. Other Branch Circuits: Class RK1, time delay.
4. Provide open-fuse indicator fuses or fuse covers with open fuse indication.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

END OF SECTION

SECTION 26 2816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Fusible switches.
2) Nonfusible switches.
3) Molded-case circuit breakers (MCCBs).
4) Enclosures.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and

manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of a nationally recognized testing laboratory (NRTL) listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
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.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. 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. Seismic requirements apply to equipment on emergency power system only.

2.2 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Source Limitations:

1. Obtain fusible switches, non-fusible switches, molded case circuit breakers and molded cased switches through one source from a single manufacturer.
2. Obtain fusible switches, non-fusible switches, molded case circuit breakers and switches from the same manufacturer as:

    a. Enclosed controllers.
    b. Distribution panelboards.
    c. Branch circuit panelboards.
    d. Low voltage transformers.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

E. Comply with NFPA 70.

2.3 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. Siemens Industry, Inc.
4. Square D; by Schneider Electric.

B. Type HD, Heavy Duty:

1. Single throw.

2. Three pole.
3. 600-V ac.
4. 200 A and smaller.
5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses.
6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.4 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. Siemens Industry, Inc.
4. Square D; by Schneider Electric.

B. Type HD, Heavy Duty, Three Pole, Single Throw, [**240**] [**600**]-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1) or gray baked enamel paint, electrodeposited on cleaned, phosphatized galvannealed steel (NEMA 250 Types 3R, 12) as specified on drawings..

C. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently

disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 PREPARATION

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect or Owner no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Architect's or Owner's written permission.
4. Comply with NFPA 70E.

3.3 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.

3.4 INSTALLATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

C. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

D. Install fuses in fusible devices.

E. Comply with NFPA 70 and NECA 1.

3.5 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, grounding, and clearances.
c. Verify that the unit is clean.
d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
e. Verify that fuse sizes and types match the Specifications and Drawings.
f. Verify that each fuse has adequate mechanical support and contact integrity.
g. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
h. Verify correct phase barrier installation.
i. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

C. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that the unit is clean.
e. Operate the circuit breaker to ensure smooth operation.
f. Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

g. Inspect operating mechanism, contacts, and chutes in unsealed units.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

3.7 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION

SECTION 26 2913.03

MANUAL AND MAGNETIC MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Manual motor controllers.
2) Combination full-voltage magnetic motor controllers.
3) Enclosures.
4) Accessories.
5) Identification.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 DEFINITIONS

A. CPT: Control power transformer.

B. MCCB: Molded-case circuit breaker.

C. MCP: Motor circuit protector.

D. NC: Normally closed.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SCPD: Short-circuit protective device.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For each type of magnetic controller.

1. Include plans, elevations, sections, and mounting details.
2. Indicate dimensions, weights, required clearances, and location and size of each field connection.
3. Wire Termination Diagrams and Schedules: Include diagrams for signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features. Differentiate between manufacturer-installed and field-installed wiring.
4. Include features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for magnetic controllers, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
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.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For magnetic controllers to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

B. Source Limitations:

1. Obtain enclosed controllers through one source from a single manufacturer.

2. Obtain enclosed controllers from the same manufacturer as:

a. Fusible and non-fusible switches.
b. Molded case circuit breakers.
c. Distribution panelboards.

d. Branch circuit panelboards.
e. Low voltage transformers.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

1.8 FIELD CONDITIONS

A. Ambient Environment Ratings: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than23 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet for electromagnetic and manual devices.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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 use.

B. UL Compliance: Fabricate and label magnetic motor controllers to comply with UL 508 and UL 60947-4-1.

C. NEMA Compliance: Fabricate motor controllers to comply with ICS 2.

D. Seismic Performance: Magnetic controllers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the controller will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Seismic requirements only apply to controllers on emergency power system.

2.2 MANUAL MOTOR CONTROLLERS

A. Motor-Starting Switches (MSS): "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Eaton.
b. General Electric Company.
c. Siemens Industry, Inc.
d. Square D; by Schneider Electric.

2. Standard: Comply with NEMA ICS 2, general purpose, Class A.
3. Configuration: Nonreversing.
4. Surface mounting.
5. Red pilot light.

B. Fractional Horsepower Manual Controllers (FHPMC): "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Eaton.
b. General Electric Company.
c. Siemens Industry, Inc.
d. Square D; by Schneider Electric.

2. Configuration: Nonreversing.
3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button; melting alloy type.
4. Pilot Light: Red.

2.3 COMBINATION FULL-VOLTAGE MAGNETIC MOTOR CONTROLLER

A. Description: Factory-assembled, combination full-voltage magnetic motor controller consisting of the controller described in this article, indicated disconnecting means, SCPD and OCPD, in a single enclosure.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. Siemens Industry, Inc.
4. Square D; by Schneider Electric.

C. Standard: Comply with NEMA ICS 2, general purpose, Class A.

D. Configuration: Nonreversing.

E. Contactor Coils: Pressure-encapsulated type.

1. Operating Voltage: Manufacturer's standard, unless indicated.

F. Control Power:

1. For on-board control power, obtain from line circuit or from integral CPT. The CPT shall have capacity to operate integral devices and remotely located pilot, indicating, and control devices.

G. Overload Relays:

1. Thermal Overload Relays:

a. Inverse-time-current characteristic.
b. Class 20 tripping characteristic.
c. Heaters in each phase shall be matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
d. Ambient compensated.
e. Automatic resetting.

H. Fusible Disconnecting Means:

1. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate indicated fuses.
2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

2.4 ENCLOSURES

A. Comply with NEMA 250, type designations as indicated on Drawings, complying with environmental conditions at installed location.

1. Dry and Clean Indoor Locations: Type 1.
2. Outdoor Locations: Type 3R.

B. The construction of the enclosures shall comply with NEMA ICS 6.

2.5 ACCESSORIES

A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.

1. Push Buttons, Pilot Lights, and Selector Switches: Standard-duty, except as needed to match enclosure type. Heavy-duty or oil-tight where indicated in the controller schedule.

a. Push Buttons: As indicated in the controller schedule.
b. Pilot Lights: As indicated in the controller schedule.

2.6 IDENTIFICATION

A. Controller Nameplates: Laminated acrylic plastic signs, as described in Section 26 0553 "Identification for Electrical Systems," for each compartment, mounted with corrosion-resistant screws.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and space conditions for compliance with requirements for motor controllers, their relationship with the motors, and other conditions affecting performance of the Work.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Wall-Mounted Controllers: Install magnetic controllers on walls with tops at uniform height indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Section 26 0529 "Hangers and Supports for Electrical Systems" unless otherwise indicated.

C. Comply with requirements for seismic control devices specified in Section 26 0548.16 "Seismic Controls for Electrical Systems."

D. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

E. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

F. Setting of Overload Relays: Select and set overloads on the basis of full-load current rating as shown on motor nameplate. Adjust setting value for special motors as required by NFPA 70 for motors that are high-torque, high-efficiency, and so on.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.4 APPLICATIONS

A. Provide separately mounted motor controllers as scheduled and shown on the drawings.

B. Recess manual starters flush in walls in all finished areas. In mechanical equipment areas or areas with exposed conduit, furnish surface enclosure.

C. Provide separate hand-off auto selector switch with maintained contacts in separate enclosure adjacent to manual starters where shown on the drawings or noted in the starter schedule.

D. Provide combination magnetic starters for all multiple phase operated equipment, as indicated in the starter schedule. All starters shall be complete with pilot lights in cover, externally operated fused disconnect switch, fuses, and three (3) proper sized overload heaters as required. Furnish additional accessories, such as auxiliary contacts, on-off selector switches, hand-off auto selector switches and push button with the starter as indicated in the schedule. All push-button and hand-off auto selector switches shall have maintained contacts.

E. Provide all magnetic and manual starters with properly sized overload elements.

F. Furnish controllers with additional accessories, such as auxiliary contacts, on-off push buttons and hand-off auto selector switches with the starter as indicated in the schedule.

G. All magnetic starters shall be provided with control coils for 120 volt control voltage. All 208 volt starters shall have a neutral in the circuit and control voltage shall be phase to neutral 120 volts.

Control transformers shall be furnished for 480 volt starters. Provide in-line fuse in secondary circuit of control transformer.

H. The schedule of starters as shown on the drawings shall indicate motor horse power, phase, voltage, starter size, starter type, auxiliary contacts, types of accessories; such as push buttons or hand-off-automatic switches.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections[**with the assistance of a factory-authorized service representative**].

B. Tests and Inspections:

1. Comply with the provisions of NFPA 70B, "Testing and Test Methods" Chapter.
2. Visual and Mechanical Inspection:

    a. Compare equipment nameplate data with drawings and specifications.
    b. Inspect physical and mechanical condition.
    c. Inspect anchorage, alignment, and grounding.
    d. Verify the unit is clean.
    e. Inspect contactors:

        1) Verify mechanical operation.
        2) Verify contact gap, wipe, alignment, and pressure are according to manufacturer's published data.

    f. Motor-Running Protection:

        1) Verify overload element rating is correct for its application.
        2) If motor-running protection is provided by fuses, verify correct fuse rating.

    g. Inspect bolted electrical connections for high resistance using one of the two following methods:

        1) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data or NETA ATS Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

    h. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

C. Motor controller will be considered defective if it does not pass tests and inspections.

END OF SECTION

SECTION 26 3213.13

DIESEL EMERGENCY ENGINE GENERATORS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Section includes packaged diesel engine generators for emergency use with the following features:

a) Diesel engine.
b) Diesel fuel-oil system.
c) Control and monitoring.
d) Generator overcurrent and fault protection.
e) Generator, exciter, and voltage regulator.
f) Outdoor engine generator enclosure.
g) Vibration isolation devices.
h) Finishes.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 26 3600 "Transfer Switches" for transfer switches, including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

1.3 DEFINITIONS

A. EPS: Emergency power supply.

B. EPSS: Emergency power supply system.

C. Operational Bandwidth: The total variation, from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Include thermal damage curve for generator.
3. Include time-current characteristic curves for generator protective device.
4. Include fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
6. Include airflow requirements for cooling and combustion air in cubic feet per minute at 0.8 power factor, with air-supply temperature of 95, 80, 70, and 50 deg F. Provide Drawings indicating requirements and limitations for location of air intake and exhausts.
7. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.

B. Shop Drawings:

1. Include plans and elevations for engine generator and other components specified. Indicate access requirements affected by height of subbase fuel tank.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates for engine generator, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails, identify center of gravity and total weight, including full fuel tank, supplied

enclosure, subbase-mounted fuel tank, and each piece of equipment not integral to the engine generator, 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.

B. Source Quality-Control Reports: Including, but not limited to, the following:

1. Certified summary of prototype-unit test report.
2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Report of sound generation.

C. Field quality-control reports.

D. Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For engine generators to include in emergency, operation, and maintenance manuals.

1.7 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. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
4. Tools: Each tool listed by part number in operations and maintenance manual.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cummins Power Generation.
2. Electric Power Division; Caterpillar, Inc.
3. Generac Power Systems, Inc.

B. Source Limitations: Obtain packaged engine generators and auxiliary components from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Engine generator housing, subbase fuel tank, engine generator, batteries, battery racks, silencers,sound attenuating equipment, accessories, and components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Shake-table testing shall comply with ICC-ES AC156. Testing shall be performed with all fluids at worst-case normal levels. Water shall be substituted for diesel fuel in fuel tank during test.
3. Component Importance Factor: 1.5.

B. B11 Compliance: Comply with B11.19.

C. NFPA Compliance:

1. Comply with NFPA 37.
2. Comply with NFPA 70.
3. Comply with NFPA 110 requirements for Level 1 EPSS.

D. UL Compliance: Comply with UL 2200.

E. Engine Exhaust Emissions: Comply with EPA Tier 3 requirements and applicable state and local government requirements.

F. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 5 to 104 deg F.
2. Relative Humidity: Zero to 95 percent.
3. Altitude: Sea level to 1000 feet.

2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.

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.

C. EPSS Class: Engine generator shall be classified as a Class 48 according to NFPA 110.

D. Service Load: <**Insert number**> kVA.

E. Power Factor: 0.8, lagging.

F. Frequency: 60 Hz

G. Voltage: 480 V ac.

H. Phase: Three-phase, three four-wire wye.

I. Induction Method: Naturally aspirated.

J. Governor: Adjustable isochronous, with speed sensing.

K. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and engine generator center of gravity.

L. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries.
2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

M. Engine Generator Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage, from no load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency, from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time: Comply with NFPA 110, Type 10 system requirements.

N. Parallel Engine Generators:

1. Generator shall have the ability to be paralleled with another generator at a future time. If paralleling control components cannot be added to this generator at a later date, those components shall be added as part of this project.

a. Automatic reactive output power control and load sharing between engine generators operated in parallel.

b. Automatic regulation, automatic connection to a common bus, and automatic synchronization, with manual controls and instruments to monitor and control paralleling functions.
c. Protective relays required for equipment and personnel safety.
d. Paralleling suppressors to protect excitation systems.
e. Reverse power protection.
f. Loss of field protection.

2.4 DIESEL ENGINE

A. Fuel: ASTM D 975 diesel fuel oil, Grade 2-D S15.

B. Rated Engine Speed: 1800 rpm.

C. Lubrication System: Engine or skid mounted.

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity and with UL 499.

E. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator mounting frame and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
2. Size of Radiator: Adequate to contain expansion of total system coolant, from cold start to 110 percent load condition.
3. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
4. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, UV-, and abrasion-resistant fabric.

a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and noncollapsible under vacuum.
b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

F. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

1. Minimum sound attenuation of 25 dB at 500 Hz.
2. Sound level measured at a distance of 25 feet from exhaust discharge after installation is complete shall be 78 dBA or less.

G. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

H. Starting System: 24 V electric, with negative ground.

1. Components: Sized so they are not damaged during a full engine-cranking cycle, with ambient temperature at maximum specified in "Performance Requirements" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified.
4. Battery: Lead acid, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least three times without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
9. Battery Charger: Current-limiting, automatic-equalizing, and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and include the following features:

a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg F to 140 deg F to prevent overcharging at high temperatures and undercharging at low temperatures.
c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
f. Enclosure and Mounting: NEMA 250, Type 1 wall-mounted cabinet.

2.5 DIESEL FUEL-OIL SYSTEM

A. Comply with NFPA 30.

B. Piping: Fuel-oil piping shall be Schedule 40 black steel, complying with requirements in Section 23 1113 "Facility Fuel-Oil Piping." Cast iron, aluminum, copper, and galvanized steel shall not be used in the fuel-oil system.

C. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions.

D. Fuel Filtering: Remove water and contaminants larger than 1 micron.

E. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

F. Subbase-Mounted, Double-Wall, Fuel-Oil Tank: Factory installed and piped, complying with UL 142 fuel-oil tank. Features include the following:

1. Tank level indicator.
2. Fuel-Tank Capacity: Minimum 133 percent of total fuel required for periodic maintenance operations between fuel refills, plus fuel for the hours of continuous operation for indicated EPSS class.
3. Leak detection in interstitial space.
4. Vandal-resistant fill cap.
5. Containment Provisions: Comply with requirements of authorities having jurisdiction.

2.6 CONTROL AND MONITORING

A. Automatic-Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

B. Provide minimum run time control set for 30 minutes, with override only by operation of a remote emergency-stop switch.

C. Comply with UL 508A.

D. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from engine generator vibration. Panel shall be powered from the engine generator battery.

E. Control and Monitoring Panel:

1. Digital controller with integrated LCD display, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
2. Analog control panel with dedicated gages and indicator lights for the instruments and alarms indicated below.
3. Instruments: Located on the control and monitoring panel and viewable during operation.

    a. Engine lubricating-oil pressure gage.
    b. Engine-coolant temperature gage.
    c. DC voltmeter (alternator battery charging).
    d. Running-time meter.
    e. AC voltmeter, for each phase.
    f. AC ammeter, for each phase.
    g. AC frequency meter.

h. Generator-voltage-adjusting rheostat.

4. Controls and Protective Devices: Controls, shutdown devices, and common visual alarm indication as required by NFPA 110 for Level [**1**] [**2**] system, including the following:

a. Cranking control equipment.
b. Run-Off-Auto switch.
c. Control switch not in automatic position alarm.
d. Overcrank alarm.
e. Overcrank shutdown device.
f. Low water temperature alarm.
g. High engine temperature pre-alarm.
h. High engine temperature.
i. High engine temperature shutdown device.
j. Overspeed alarm.
k. Overspeed shutdown device.
l. Low-fuel main tank.

1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for the duration required for the indicated EPSS class.

m. Coolant low-level alarm.
n. Coolant low-level shutdown device.
o. Coolant high-temperature prealarm.
p. Coolant high-temperature alarm.
q. Coolant low-temperature alarm.
r. Coolant high-temperature shutdown device.
s. EPS load indicator.
t. Battery high-voltage alarm.
u. Low-cranking voltage alarm.
v. Battery-charger malfunction alarm.
w. Battery low-voltage alarm.
x. Lamp test.
y. Contacts for local and remote common alarm.
z. Low-starting air pressure alarm.
aa. Low-starting hydraulic pressure alarm.
bb. Remote manual-stop shutdown device.
cc. Air shutdown damper alarm when used.
dd. Air shutdown damper shutdown device when used.
ee. Generator overcurrent-protective-device not-closed alarm.

F. Connection to Datalink:

1. A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication.

G. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Overcrank alarm.
2. Coolant low-temperature alarm.
3. High engine temperature prealarm.

4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low-fuel main tank alarm.
8. Low coolant level alarm.
9. Low-cranking voltage alarm.
10. Contacts for local and remote common alarm.
11. Audible-alarm silencing switch.
12. Air shutdown damper when used.
13. Run-Off-Auto switch.
14. Control switch not in automatic position alarm.
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel-supply alarm.
17. Lamp test.
18. Low-cranking voltage alarm.
19. Generator overcurrent protective device not closed.

H. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator unless otherwise indicated.

I. Remote Emergency-Stop Switch: Surface; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.

1. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

B. Generator Circuit Breaker: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.

1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
2. Trip Settings: Selected to coordinate with generator thermal damage curve.
3. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.

C. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground fault.

1. Indicate ground fault with other engine generator alarm indications.
2. Trip generator protective device on ground fault.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide six-lead alternator.

E. Range: Provide broad range of output voltage by adjusting the excitation level.

F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

G. Enclosure: Dripproof.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.

1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.

J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

L. Subtransient Reactance: 12 percent, maximum.

2.9 OUTDOOR ENGINE GENERATOR ENCLOSURE

A. Description: Vandal-resistant, sound-attenuating, weatherproof steel housing, wind resistant up to 100 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

1. Sound Attenuation Level: Level 2.

B. Description: Prefabricated or pre-engineered, galvanized-steel-clad, integral structural-steel-framed, walk-in enclosure, erected on concrete foundation.

C. Structural Design and Anchorage: Comply with ASCE/SEI 7 for wind loads of up to 100 mph.

D. Seismic Design: Comply with seismic requirements in Section 26 0548.16 "Seismic Controls for Electrical Systems."

E. Hinged Doors: With padlocking provisions.

F. Space Heater: Thermostatically controlled and sized to prevent condensation.

G. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine generator components.

H. Muffler Location: Within enclosure.

I. Engine-Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for two hours with ambient temperature at top of range specified in system service conditions.

1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
2. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.

2.10 VIBRATION ISOLATION DEVICES

A. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.

1. Housing: Steel with resilient, vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch-thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment-mounting and -leveling bolt that acts as blocking during installation.
2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Minimum Deflection: 1 inch.

B. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

2.11 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.12 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Architect or Owner no fewer than seven working days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Architect's or Owner's written permission.

3.3 INSTALLATION

A. Comply with NECA 1 and NECA 404.

B. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.

C. Equipment Mounting:

1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 03 3000 "Cast-in-Place Concrete" or Section 03 3053 "Miscellaneous Cast-in-Place Concrete."
2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
3. Install packaged engine generator with restrained spring isolators having a minimum deflection of 1 inch on 4-inch-high concrete base. Secure sets to anchor bolts installed in concrete bases. Concrete base construction is specified in Section 26 0548.16 "Seismic Controls for Electrical Systems."

D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

E. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4 CONNECTIONS

A. Ground equipment according to Section 26 0526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.

C. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 IDENTIFICATION

A. Identify system components according to Section 23 0553 "Identification for HVAC Piping and Equipment" and Section 26 0553 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

C. Tests and Inspections:

1. Perform tests recommended by manufacturer and in "Visual and Mechanical Inspection" and "Electrical and Mechanical Tests" subparagraphs below, as specified in the NETA ATS. Certify compliance with test parameters.

    a. Visual and Mechanical Inspection:

        1) Compare equipment nameplate data with Drawings and the Specifications.
        2) Inspect physical and mechanical condition.
        3) Inspect anchorage, alignment, and grounding.
        4) Verify that the unit is clean.

    b. Electrical and Mechanical Tests:

        1) Perform insulation-resistance tests according to IEEE 43.

            a) Machines Larger Than 200 hp: Test duration shall be 10 minutes. Calculate polarization index.
            b) Machines 200 hp or Less: Test duration shall be one minute. Calculate the dielectric-absorption ratio.

        2) Test protective relay devices.
        3) Verify phase rotation, phasing, and synchronized operation as required by the application.
        4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
        5) Conduct performance test according to NFPA 110.
        6) Verify correct functioning of the governor and regulator.

2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

    a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
    b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
    c. Verify acceptance of charge for each element of the battery after discharge.
    d. Verify that measurements are within manufacturer's specifications.

4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
6. Noise-Level Tests: Measure A-weighted level of noise emanating from engine generator installation, including engine exhaust and cooling-air intake and discharge, at four locations 25 feet from edge of the generator enclosure, and compare measured levels with required values.

D. Coordinate tests with tests for transfer switches, and run them concurrently.

E. Test instruments shall have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.

F. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.

G. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.

H. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

I. Remove and replace malfunctioning units and retest as specified above.

J. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.

K. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component, indicating satisfactory completion of tests.

3.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 24 months' full maintenance by skilled employees of manufacturer's authorized service representative. Include quarterly preventive maintenance and exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Parts shall be manufacturer's authorized replacement parts and supplies.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION

SECTION 26 3600

TRANSFER SWITCHES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Section includes automatic transfer switches rated 600 V and less, including the following:

a) Remote annunciator system.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 26 3213.13 – Diesel Emergency Engine Generators for diesel engine, diesel fuel-oil system, control and monitoring, generator overcurrent and fault protection, generator, exciter and voltage regulator, outdoor engine generator enclosure, vibration isolation devices, finishes.

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 transfer switches.
2. Include rated capacities, operating characteristics, electrical characteristics, and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
2. Include material lists for each switch specified.
3. Single-Line Diagram: Show connections between transfer switch,power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For transfer switches, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
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.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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.

B. Comply with NEMA ICS 1.

C. Comply with NFPA 110.

D. Comply with UL 1008 unless requirements of these Specifications are stricter.

E. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer.

F. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

G. Repetitive Accuracy of Solid-State Controls: All settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

H. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

I. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism. Switches for emergency or standby purposes shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.

J. Neutral Terminal: Solid and fully rated unless otherwise indicated.

K. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, by color-code or by numbered or lettered wire and cable shrinkable sleeve markers at terminations. Color-coding and wire and cable markers are specified in Section 260553 "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
4. Accessible via front access.

L. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.2 CONTACTOR-TYPE AUTOMATIC TRANSFER SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cummins Power Generation.
2. Eaton.
3. Emerson.
4. Generac Power Systems, Inc.
5. Russelectric.

B. Comply with Level 1 equipment according to NFPA 110.

C. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are unacceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Contactor-style automatic transfer-switch units, rated 600 A and higher, shall have separate arcing contacts.
4. Conductor Connectors: Suitable for use with conductor material and sizes.
5. Material: Tin-plated aluminum.
6. Main and Neutral Lugs: Mechanical type.
7. Ground Lugs and Bus-Configured Terminators: Mechanical type.
8. Ground bar.
9. Connectors shall be marked for conductor size and type according to UL 1008.

D. Automatic Open-Transition Transfer Switches: Interlocked to prevent the load from being closed on both sources at the same time.

1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.

E. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

F. Automatic Transfer-Switch Controller Features:

1. Controller operates through a period of loss of control power.
2. Undervoltage Sensing for Each Phase of Normal and Alternate Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.

11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is unavailable.

2.3 TRANSFER SWITCH ACESSORIES

A. Remote Annunciator System:

1. Source Limitations: Same manufacturer as transfer switch in which installed.
2. Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches.
3. Annunciation panel display shall include the following indicators:

    a. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
    b. Switch position.
    c. Switch in test mode.
    d. Failure of communication link.

4. Annunciator Panel: LED-lamp type with audible signal and silencing switch.

    a. Indicating Lights: Grouped for each transfer switch monitored.
    b. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
    c. Mounting: Modular, steel cabinet unless otherwise indicated.
    d. Lamp Test: Push-to-test or lamp-test switch on front panel.

2.4 SOURCE QUALITY CONTROL

A. Prepare test and inspection reports.

1. For each of the tests required by UL 1008, performed on representative devices, for emergency systems. Include results of test for the following conditions:

    a. Overvoltage.
    b. Undervoltage.
    c. Loss of supply voltage.
    d. Reduction of supply voltage.
    e. Alternative supply voltage or frequency is at minimum acceptable values.
    f. Temperature rise.
    g. Dielectric voltage-withstand; before and after short-circuit test.
    h. Overload.

i. Contact opening.
j. Endurance.
k. Short circuit.
l. Short-time current capability.
m. Receptacle withstand capability.
n. Insulating base and supports damage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Annunciator and Control Panel Mounting: Flush in wall unless otherwise indicated.

B. Identify components according to Section 260553 "Identification for Electrical Systems."

C. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

D. Comply with NECA 1.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to generator sets,control, and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Wiring Method: Install cables in raceways and cable trays except within electrical enclosures. Conceal raceway and cables except in unfinished spaces.

1. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 271500 "Communications Horizontal Cabling."

F. Route and brace conductors according to manufacturer's written instructions and Section 260529 "Hangers and Supports for Electrical Systems." Do not obscure manufacturer's markings and labels.

G. Brace and support equipment according to Section 260548.16 "Seismic Controls for Electrical Systems."

H. Final connections to equipment shall be made with liquidtight, flexible metallic conduit no more than 18 inches in length.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. After installing equipment, test for compliance with requirements according to NETA ATS.
2. Visual and Mechanical Inspection:

    a. Compare equipment nameplate data with Drawings and Specifications.
    b. Inspect physical and mechanical condition.
    c. Inspect anchorage, alignment, grounding, and required clearances.
    d. Verify that the unit is clean.
    e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
    f. Verify that manual transfer warnings are attached and visible.
    g. Verify tightness of all control connections.
    h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:

        1) Use of low-resistance ohmmeter.
        2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.

    i. Perform manual transfer operation.
    j. Verify positive mechanical interlocking between normal and alternate sources.
    k. Perform visual and mechanical inspection of surge arresters.
    l. Inspect control power transformers.

        1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
        2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
        3) Verify correct functioning of drawout disconnecting contacts, grounding contacts, and interlocks.

3. Electrical Tests:

    a. Perform insulation-resistance tests on all control wiring with respect to ground.
    b. Verify settings and operation of control devices.
    c. Calibrate and set all relays and timers.
    d. Verify phase rotation, phasing, and synchronized operation.
    e. Perform automatic transfer tests.
    f. Verify correct operation and timing of the following functions:

        1) Normal source voltage-sensing and frequency-sensing relays.
        2) Engine start sequence.
        3) Time delay on transfer.
        4) Alternative source voltage-sensing and frequency-sensing relays.
        5) Automatic transfer operation.
        6) Interlocks and limit switch function.
        7) Time delay and retransfer on normal power restoration.
        8) Engine cool-down and shutdown feature.

4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

5. After energizing circuits, perform each electrical test for transfer switches stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and retransfer from emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for one pole deviating by more than 50 percent from other poles.
    g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

6. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Transfer switches will be considered defective if they do not pass tests and inspections.

F. Remove and replace malfunctioning units and retest as specified above.

G. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.

B. Training shall include testing ground-fault protective devices and instructions to determine when the ground-fault system shall be retested. Include instructions on where ground-fault sensors

are located and how to avoid negating the ground-fault protection scheme during testing and circuit modifications.

C. Coordinate this training with that for generator equipment.

END OF SECTION

SECTION 26 4113

LIGHTNING PROTECTION FOR STRUCTURES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Section includes lightning protection system for ordinary structures.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include layouts of the lightning protection system, with details of the components to be used in the installation.
2. Include raceway locations needed for the installation of conductors.
3. Details of air terminals, ground rods, ground rings, conductor supports, splices, and terminations, including concealment requirements.
4. Include roof attachment details, coordinated with roof installation.
5. Calculations required by NFPA 780 for bonding of metal bodies.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Lightning protection system Shop Drawings, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lightning protection cabling attachments to roofing systems and accessories.
2. Lightning protection strike termination device attachment to roofing systems, coordinated with the roofing system manufacturer.
3. Lightning protection system components penetrating roofing and moisture protection systems and system components, coordinated with the roofing system manufacturer.

B. Qualification Data: For Installer.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For lightning protection system to include in maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Dimensioned site plan showing dimensioned route of the ground loop conductor and the ground rod locations. Comply with requirements of Section 017839 "Project Record Documents."
b. A system testing and inspection record, listing the results of inspections and ground resistance tests, as recommended by NFPA 780, Annex D.

B. Completion Certificate:

1. UL Master Label Certificate.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: UL-listed installer, category OWAY.

PART 2 - PRODUCTS

2.1 LIGHTNING PROTECTION FOR STRUCTURES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ERICO; brand of nVent Electrical plc.
2. East Coast Lightning Equipment Inc.
3. Harger Lightning & Grounding; business of Harger, Inc.
4. Heary Bros. Lightning Protection Co. Inc.
5. Independent Protection Co.
6. National Lightning Protection.
7. Preferred Lightning Protection.

8. Robbins Lightning, Inc.
9. Thompson Lightning Protection, Inc.
10. VFC Lightning Protection.
11. allG Fabrication (formerly ALT).

2.2 PERFORMANCE REQUIREMENTS

A. UL Lightning Protection Standard: Comply with UL 96A requirements for Class I buildings.

B. Lightning Protection Components, Devices, and Accessories: Listed and labeled by a qualified testing agency as complying with UL 96, and marked for intended location and application.

2.3 MATERIALS

A. Air Terminals:

1. Aluminum unless otherwise indicated.
2. [**3/8-inch**] [**1/2-inch**] [**5/8-inch**] diameter by [**10 inches**] [**12 inches**] [**15 inches**] [**18 inches**] [**24 inches**] <**Insert length of air terminal**> long.
3. [**Pointed**] [**Rounded**] tip.
4. [**Integral base support**] [**Threaded base support**].

B. Air Terminal Bracing:

1. [**Aluminum**] [**Copper**] [**Stainless steel**] [**Galvanized steel**].
2. [**1/4-inch**] <**Insert size**> diameter rod.

C. Class I Main Conductors:

1. [**Stranded Copper: 57,400 circular mils in diameter**] [**Aluminum: 98,600 circular mils in diameter**].

D. Class II Main Conductors:

1. [**Stranded Copper: 115,000 circular mils in diameter**] [**Aluminum: 192,000 circular mils in diameter**].

E. Secondary Conductors:

1. [**Stranded Copper: 26,240 circular mils in diameter**] [**Aluminum: 41,400 circular mils in diameter**].

F. Ground Loop Conductor: [**Stranded copper**] [**Tinned copper**]**.**

G. Ground Rods:

1. Material: [**Solid copper**] [**Copper-clad steel**] [**Stainless steel**].
2. Diameter: [**5/8 inch**] [**3/4 inch**].
3. Rods shall be not less than 120 inches long.
4. [**Sectional type, with integral threads**].

H. Conductor Splices and Connectors: Compression fittings that are installed with hydraulically operated tools, or exothermic welds, approved for use with the class type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lightning protection components and systems according to [**UL 96A**] [**NFPA 780**].

B. Install conductors with direct paths from air terminals to ground connections. Avoid bends less than 90 degrees and 8 inches in radius and narrow loops.

C. Conceal conductors within normal view from exterior locations at grade within 200 feet of building. Comply with requirements for [**concealed installations in UL 96A**] [**concealed systems in NFPA 780**].

1. Roof penetrations required for down conductors and connections to structural-steel framework shall be made using listed through-roof fitting and connector assemblies with solid rods and appropriate roof flashings. Use materials approved by the roofing manufacturer for the purpose. Conform to the methods and materials required at roofing penetrations of the lightning protection components to ensure compatibility with the roofing specifications and warranty.
2. Install conduit where necessary to comply with conductor concealment requirements.
3. Air Terminals on Single-Ply Membrane Roofing: Comply with adhesive manufacturer's written instructions.

D. Ground Ring Electrode: The conductor shall be not less than the main-size lightning conductor.

3.2 CONNECTIONS

A. Aboveground concealed connections, and connections in earth or concrete, shall be done by exothermic welds or by high-compression fittings listed for the purpose.

B. Aboveground exposed connections shall be done using the following types of connectors, listed and labeled for the purpose: [**bolted connectors**] [**exothermic weld**] [**high compression**] [**crimp**].

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

3.3 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.

B. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: [**Owner will engage**] [**Engage**] a qualified special inspector to perform the following special inspections:

1. Perform inspections as required to obtain a UL Master Label for system.
2. Perform inspections to obtain an LPI certification.

B. Prepare test and inspection reports and certificates.

END OF SECTION

SECTION 26 5119

LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Section includes the following types of LED luminaires:

a) Downlight.
b) Linear industrial.
c) Recessed, linear.
d) Strip light.
e) Surface mount, linear.
f) Suspended, linear.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 26 0923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
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.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.9 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Seismic requirements apply to light fixtures on emergency power system only.

B. Ambient Temperature: 41 to 104 deg F.

1. Relative Humidity: Zero to 95 percent.

C. Altitude: Sea level to 1000 feet.

2.2 LUMINAIRE REQUIREMENTS

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.

B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI.

C. Recessed luminaires shall comply with NEMA LE 4.

D. Provide luminaires from a single manufacturer for each luminaire type.

2.3 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Steel:

1. ASTM A 36/A 36M for carbon structural steel.
2. ASTM A 568/A 568M for sheet steel.

C. Stainless Steel:

1. 1. Manufacturer's standard grade.
2. 2. Manufacturer's standard type, ASTM A 240/240 M.

D. Galvanized Steel: ASTM A 653/A 653M.

E. Aluminum: ASTM B 209.

2.4 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.5 LUMINAIRE SUPPORT

A. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

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. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Lighting Fixtures: Set level, plumb and square with ceilings and walls. Install lamps in each fixture.

C. Support all fixtures from the building structure and not from the ceiling suspension system.

D. Support the fixtures from the bar joists, floor structure or roof structure above.

E. When a fixture occurs under ducts, the widths of duct shall be spanned with metal framing channel suspended and supported at both ends and the fixture attached to the metal framing channel.

F. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

G. Install lamps in each luminaire.

H. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

I. Flush-Mounted Luminaires:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

J. Wall-Mounted Luminaires:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

K. Suspended Luminaires:

1. Ceiling Mount:

   a. Two 5/32-inch- diameter aircraft cable supports adjustable to 10 feet in length.

2. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

L. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

M. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

N. Security type fixtures shall be installed per manufacturer instructions to maintain secure rating.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to three visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION

SECTION 26 5213

EMERGENCY AND EXIT LIGHTING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Exit signs.
2) Luminaire supports.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.

D. Fixture: See "Luminaire" Paragraph.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of emergency lighting unit, exit sign, and emergency lighting support.

1. Include data on features, accessories, and finishes.
2. Include physical description of the unit and dimensions.
3. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
4. Include photometric data and adjustment factors based on laboratory tests, complying with IES LM-45, for each luminaire type.

B. Product Schedule:

1. For exit signs. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
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.
4. Provide seismic qualification certificate for each piece of equipment.

B. Product Test Reports: For each luminaire for tests performed by [**manufacturer and witnessed by a qualified testing agency**] [**a qualified testing agency**].

C. Sample Warranty: For manufacturer's[**special**] warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 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. Exit signs: Two of each type installed.

1.7 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.9 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."
2. Seismic requirements apply to light fixtures on emergency power system only.

2.2 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

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.

B. Comply with NFPA 70 and NFPA 101.

C. Provide luminaires from a single manufacturer for each luminaire type.

2.3 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access:

1. Smooth operating, free of light leakage under operating conditions.
2. Designed to permit relamping without use of tools.
3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
4. Acrylic: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
5. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

C. Conduit: Electrical metallic tubing, minimum 3/4 inch in diameter.

2.4 METAL FINISHES

A. 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 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Lighting Fixtures: Set level, plumb and square with ceilings and walls. Install lamps in each fixture.

C. Support all fixtures from the building structure and not from the ceiling suspension system.

D. Support the fixtures from the bar joists, floor structure or roof structure above.

E. When a fixture occurs under ducts, the widths of duct shall be spanned with metal framing channel suspended and supported at both ends and the fixture attached to the metal framing channel.

F. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

G. Supports:

1. Sized and rated for luminaire[**and emergency power unit**] weight.
2. Able to maintain luminaire position when testing emergency power unit.

3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire unit weight and vertical force of 400 percent of luminaire weight.

H. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

I. Suspended Luminaire Support:

1. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
2. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

J. Ceiling Grid Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

END OF SECTION

SECTION 26 5613

LIGHTING POLES AND STANDARDS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Poles and accessories for support of luminaires.
2) Luminaire-lowering devices.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 26 5619 – LED Exterior Lighting for exterior solid-state luminaires that are designed for and exclusively use LED lamp technology, luminaire supports.

1.3 DEFINITIONS

A. EPA: Equivalent projected area.

B. Luminaire: Complete lighting fixture.

C. Pole: Luminaire-supporting structure, including tower used for large-area illumination.

D. Standard: See "Pole."

1.4 ACTION SUBMITTALS

A. Product Data: For each pole, accessory, and luminaire-supporting and -lowering device, arranged as indicated.

1. Include finishes for lighting poles and luminaire-supporting devices.
2. Anchor bolts.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For poles to include in emergency, operation, and maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store poles on decay-resistant skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

B. Retain factory-applied pole wrappings on metal poles until right before pole installation. Handle poles with web fabric straps.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of pole(s) that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within a specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.

1. Warranty Period: one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 STEEL POLES

A. <Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American LitePole.
2. Bridgewell Resources.
3. Cooper Lighting, an Eaton business.
4. E-conolight.
5. EGS/Appleton Electric.
6. H.E. Williams.
7. Hapco.
8. Hubbell Incorporated.
9. KIM Lighting.
10. Lithonia Lighting; Acuity Brands Lighting, Inc.
11. LSI Corporation of America.
12. Millerbernd Manufacturing Company.
13. NAFCO International.
14. Ruud Lighting Direct.

B. Source Limitations: Obtain poles from single manufacturer or producer.

C. Poles: Comply with ASTM A 500/A 500M, Grade B carbon steel with a minimum yield of 46,000 psig; one-piece construction up to 40 feet in height with access handhole in pole wall.

1. Shape: Square, straight.
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

D. Brackets for Luminaires: Detachable, cantilever, without underbrace.

1. Adaptor fitting welded to pole, allowing the bracket to be bolted to the pole-mounted adapter, then bolted together with stainless-steel bolts.

E. Fasteners: Stainless steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.

1. Materials: Compatible with poles and standards as well as the substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.

F. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size indicated, and accessible through handhole.

G. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

H. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported load multiplied by a 5.0 safety factor.

I. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces according to SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high gloss, high-build polyurethane enamel.

a. Color: As indicated on drawings.

2.2 POLE ACCESSORIES

A. Base Covers: Manufacturers' standard metal units, finished same as pole, and arranged to cover pole's mounting bolts and nuts.

2.3 MOUNTING HARDWARE

A. Anchor Bolts: Manufactured to ASTM F 1554, Grade 55, with a minimum yield strength of 55,000 psi.

1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
2. Bent rods in diameter by <**Insert inches**> in length.
3. Threading: Uniform National Coarse, Class 2A.

B. Nuts: ASTM A 563, Grade A, Heavy-Hex

1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
2. Four nuts provided per anchor bolt, shipped with nuts pre-assembled to the anchor bolts.

C. Washers: ASTM F 436, Type 1.

1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
2. Two washers provided per anchor bolt.

2.4 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine poles, luminaire-mounting devices, lowering devices, and pole accessories before installation. Components that are scratched, dented, marred, wet, moisture damaged, or visibly damaged are considered defective.

C. Examine roughing-in for foundation and conduit to verify actual locations of installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 POLE FOUNDATION

A. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123 M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

B. Anchor Bolts: Install plumb using manufacturer-supplied template, uniformly spaced.

3.3 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on pole.

B. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."

C. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level according to pole manufacturer's written instructions.

1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
3. Install base covers unless otherwise indicated.
4. Use a short piece of 1/2 -inch diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

D. Poles and Pole Foundations Set in Concrete-Paved Areas: Install poles with a minimum 6-inch-wide, unpaved gap between the pole or pole foundation and the edge of the adjacent concrete slab. Fill unpaved ring with pea gravel. Insert material to a level 1 inch below top of concrete slab.

E. Raise and set pole using web fabric slings (not chain or cable) at locations indicated by manufacturer.

3.4 CORROSION PREVENTION

A. Steel Conduits: Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50-percent overlap.

3.5 GROUNDING

A. Ground Metal Poles and Support Structures: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

END OF SECTION

SECTION 26 5619

LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2) Luminaire supports.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 26 0923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 26 5613 "Lighting Poles and Standards" for poles and standards used to support exterior lighting equipment.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaire.
4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
5. Photometric data and adjustment factors based on laboratory tests, complying with IES LM-79 and IES LM-80.
6. Wiring diagrams for power, control, and signal wiring.
7. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

1.5 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Provide luminaires from a single manufacturer for each luminaire type.

B. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.9 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including luminaire support components.
b. Faulty operation of luminaires and accessories.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

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.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. UL Compliance: Comply with UL 1598 and listed for wet location.

D. CRI of minimum 80. CCT of 4100 K.

E. L70 lamp life of 50,000 hours.

F. Internal driver.

G. Source Limitations: Obtain luminaires from single source from a single manufacturer.

2.2 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

C. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

D. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

E. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

F. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage and coating.
c. CCT and CRI for all luminaires.

2.3 FINISHES

A. Variations in Finishes: 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.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

a. Color: As selected from manufacturer's standard catalog of colors.

2.4 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

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. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine walls for suitable conditions where luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.

I. Coordinate layout and installation of luminaires with other construction.

J. Adjust luminaires that require field adjustment or aiming.

K. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables" and Section 26 0533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 26 0533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain luminaires.

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to three visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION

SECTION 27 0500

COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the technology drawings:

1) Communication equipment coordination and installation.
2) Common communication installation requirements.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the technology drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the technology drawings.

PART 2 - PRODUCTS – DOES NOT APPLY

PART 3 - EXECUTION

3.1 INSPECTION OF BID DOCUMENTS AND PREMISES

A. Visit the premises, take measurements and verify all elevations shown on the drawings, inspect existing conditions and limitations, obtain first hand information necessary to submit a complete bid.

B. Thoroughly examine the complete set of contract documents including work required by other trades. Bidders are cautioned to acquaint themselves with requirements necessitating installation work of material or equipment furnished by other contractors or the Owner.

C. In the event of any conflict, discrepancy or inconsistency among the Contract Documents, interpretation shall be based on the following descending order or priority:

1. Specifications.
2. Drawings, and among the drawings, the following:

    a. as between figures given on drawings and scaled measurements, the figures shall govern;
    b. as between large scale drawings and small scale drawings, the large scale drawings shall govern.

3. In the event that Work is called for by the drawings but not by the specifications, or by the specifications but not by the drawings, the Contractor shall be responsible for such Work.

3.2 PERMITS AND FEES

A. Obtain and pay for all permits and make all deposits necessary for the installation of the work under his contract.

B. Where inspections of the work are required by State or local authorities, obtain certificates of inspection of the work by such authorities, and these certificates (in triplicate) shall be submitted to the Architect / Engineer.

3.3 COORDINATION

A. Coordinate arrangement, mounting, and support of communication equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Review the actual conduit/pathway plans within the construction documents to ensure such installations for communication system wiring are correctly sized, adequately positioned, and have the requisite number of pull boxes for installation. The Contractor shall be responsible for all costs associated with conduit changes resulting from failure to preview and approve the conduit/pathway installed by others.

3.4 DRAWINGS

A. All communication drawings are diagrammatic, and it is the contractor’s responsibility to install a complete working system. Special care shall be exercised in the installation of the work to include all material and fittings necessary for a complete installation. Exact dimensions and locations of all outlets shall be verified on site. Before preparing a bid or proposal, the contractor shall examine all architectural and engineering drawings. If any discrepancies or details of the construction interfere with the work, the contractor shall report the same and

obtain written instructions as to the changes necessary. Should he neglect to do so, he shall make the necessary changes at his own expense. Modifications of drawings are permissible if coordinated with Engineer/Architect and allowed by Owner.

B. The drawings show only the general routing of the conduit, wiring, pathways, etc. The scale of the drawing does not permit the indication of all junction boxes, pull boxes, and fittings that may be required. The cost of such work shall be considered as part of the contract and extra payment will not be made for such work.

C. Contractor shall refer to plans for the location of communication devices and equipment (data/voice jacks, AV devices, security devices, etc.)

D. Refer to all architectural drawings, including casework drawings, during installation of all devices such that no conflicts will be encountered. Inform architect of any conflicts that occur before the installation of above said devices.

E. Refer to all architectural drawings for elevations of all communication devices.

3.5 INTERRUPTION OF COMMUNICATION SYSTEM SERVICES

A. Do not interrupt communication system services (internet, CATV, etc.) to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect or Owner no fewer than seven days in advance of proposed interruption of communication service. Indicate:

    a. Communication system service type.
    b. The extent of the work to be done during the outage.
    c. Probable length of time required for the outage.
    d. Designed time at which the outage is to begin.

2. Do not proceed with interruption of communication system service without Architect's or Owner's written permission.
3. Schedule work to minimize the number and length of time of the outage(s) or interruption(s) of the various systems and services.

3.6 WIRELESS ACCESS POINTS (WAPs)

A. All new WAPs shall be provided by the Owner and shall be installed by the Contractor. Asset tagging will be performed by the Owner prior to turning over to contractor - contractor shall sign for receipt of the WAP devices prior to installation.

B. Contractor shall utilize grid mounting clips and cradle furnished with WAP unit for lay-in ceiling installation. For tegular ceiling installations, contractor shall provide additional rail kit as required. Install ID tag on ceiling grid and on label field on coverplate. For locations that are wall mounted, contractor shall furnish and install Oberon Series #1011-00-WH wall mount bracket or similar with data jack enclosure. The final model number shall match Owner’s WAP device being provided. Coordinate final WAP model with Owner prior to ordering unit.

C. All WAP locations shall be provided with boxes, coverplates, jacks, cabling, patch cords and raceway as needed. All exposed conduits in gymnasiums, multipurpose rooms, pools, and other areas shall be painted out to match area.

D. Contractor shall patch-in all WAPs into network jacks.

3.7 COMMON REQUIREMENTS FOR COMMUNICATION INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communication equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Space Preference:

1. Carefully verify and coordinate the location and level of all lines. Run preliminary levels and check with all other contractors so that conflict in location may be avoided.
2. If conflicts occur, the following preference schedule shall be followed:

    a. Recessed electric fixtures.
    b. High pressure ductwork.
    c. Sanitary drainage.
    d. Steam condensate, hot and chilled water.
    e. Low pressure ductwork.
    f. Domestic water storm and vent lines.
    g. Electric conduits.

3. No other work shall have preference over plumbing lines below fixtures.
4. No other work shall have preference over conduit above or below electric switchgear and above or below panels.
5. No piping conveying fluids shall be provided directly over communication equipment.

F. Lines and Levels: Determine all grades, maintain necessary lines and levels throughout the progress of the work and assume full responsibility for their correctness. Where levels are indicated on the drawings, work shall be installed at those levels unless prior written approval to change is obtained from the Architect / Engineer.

G. Location of Equipment: The approximate location of all equipment is shown on the drawings. The Architect / Engineer reserves the right to change the location of all equipment 5' in any direction without these changes being made the subject of an extra charge provided such changes are made before final installation.

3.8 DEMOLITION

A. Refer to Division 1 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.

B. Disconnect and remove communication systems, equipment and components indicated to be removed.

1. Communication device to be Removed: Remove communication device indicated to be removed along with associated, trim, supports and fixture whips.
2. Communication Equipment to be Removed: Remove communication equipment indicated to be removed along with associated supports, fittings, raceways and conductors.
3. Communication wiring to be Removed: Remove wiring indicated to be removed along with associated supports, fittings, raceway and conductors.

C. All removed communication equipment, devices, raceways, conductors, unless noted otherwise on drawings, shall become property of the Contractor and shall be properly disposed of by the Contractor. All removed communication equipment shall be turned over to the Owner.

D. Removal of existing communication devices shall be such that all existing remaining communication devices are kept in continuous service.

E. Existing system wiring connected to communication devices being removed shall be disconnected and removed back to next active remaining device.

F. Existing communication system wiring connected to other devices or other communication equipment that are not to be removed or disconnected and are passing through junction boxes and conduit that are being removed; shall be rerouted from remaining existing device to next remaining device as necessary to keep remaining devices in service and existing system wiring continuous.

G. Where connections of existing devices cannot be made continuous with existing conduit, boxes and wiring; new raceways and wiring shall be installed from existing remaining device to next remaining device.

H. For each item disconnected and removed, disconnect and remove defunct communication system wiring back to next active remaining device or to communication equipment from which the circuit originates.

I. For each item disconnected and removed, disconnect and remove abandoned, exposed conduits, and / or conduits made exposed by demolition, back to next active remaining device or to communication equipment from which the circuit originates.

J. All conditions shall be carefully field determined and verified.

K. Provide all abandoned ceiling outlets, switch boxes and outlet boxes with blank coverplates.

3.9 OPENINGS IN NEW CONSTRUCTION

A. Openings required in new construction for communication work will be provided by the General Contractor at the request of and in accordance with information furnished by the Communications Contractor. The General Contractor will advise the Communications Contractor in advance so that he may lay out the required openings. If said Communications Contractor fails to lay out required openings, he shall be financially responsible for the necessary cutting, patching and repairing. The patching and repairing will be done by the General Contractor.

3.10 CUTTING AND PATCHING

A. Examine architectural and structural drawings to determine the general nature of the types of construction to be encountered during performance of communication work.

B. All cutting and patching of masonry, carpentry, steel, iron work, concrete structural work, and finished surfaces belonging to the building shall be done in order that work may be properly installed. Replace or repair all disturbed constructions or finishes to its original condition and under no condition cut structural work except upon approval of the Architect / Engineer.

C. Cut through ceilings, floors, walls and partitions in a careful manner and fill the openings around the pipes and sleeves.

D. Carefully coordinate locations of openings and sleeves to avoid conflict with other trades. Furnish complete information concerning locations and sizes of openings to other trades in sufficient time for inclusion on their shop drawings.

E. Employ craftsmen and mechanics who are skilled and experienced in their respective trades to perform all cutting, fitting, matching, patch repairing, and finishing work required for installation of communication work.

F. Perform cutting to neat line, in a manner that will not weaken the wall, partition, or floor being cut. Cut holes in floors to neat line. Perform drilling in a manner that will not cause breaking of floor around the drilled hole.

G. Contractor shall patch, repair and unify all work and material that is cut.

3.11 OPENINGS IN EXISTING CONSTRUCTION

A. In existing construction, perform all cutting and patching where required in connection with the work. Match patching to existing adjacent surfaces.

B. All cutting in existing structural elements of building shall be accomplished with hole saws. Air hammers and cutting torches are not permitted.

C. Reinforced concrete slabs, steel joists, concrete floors and footings, or other structural work shall not be cut or disturbed in any way, unless as approved by the Architect / Engineer. The Contractor shall be held responsible for and correct all damage that he may cause.

D. Openings between conduit and floors or walls through fire or smoke barriers shall be closed with fire stop material to maintain fire or smoke barrier rating.

E. Fire stop material shall be Dow Corning 3-6548 Silicone RTV Foam, Chase Technology Corp. CTC PR-855 fire-resistant foam sealant, 3M CP-25 Series Caulk Fire Barrier, T & B S-101 Fire Barrier or Nelson Flameseal.

3.12 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communication installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping".

3.13 FIELD CORRECTIONS AND CHANGES

A. Carefully and accurately record on field set of drawings, any deviations or changes in locations of conduit, wiring and/or equipment made in the field and shall keep the Architect / Engineer informed on all deviations and changes.

B. At the completion of the job, furnish the Architect / Engineer three (3) complete sets (not the field set) of drawings indicating these deviations or changes. Extra sets of drawings will be provided to the contractor for this purpose. Any changes in the exterior work shall be recorded by dimension.

3.14 OPERATION AND MAINTENANCE INSTRUCTIONS

A. Before final acceptance of communication installations, provide to the Architect / Engineer three (3) bound copies of a complete set of operating and maintenance instructions and procedures for all communication systems and equipment furnished under this contract.

B. Prepare a complete file of maintenance and operating instructions which covers all communication systems and equipment listed in the section entitled "Submittals".

C. Data shall be placed in an 8-1/2" x 11" slide hinge, heavy duty, three-post type, stiff cover binder. Each completed binder shall not exceed 3-1/2" in thickness. Label binder as follows:

COMMUNICATION SYSTEMS
MAINTANENANCE AND OPERATING INSTRUCTIONS
CHAMPAIGN COUNTY JAIL CONSOLIDATION
URBANA, ILLINOIS

D. Data shall include a complete table of contents, tabs, final approved shop drawings, wiring diagrams, manufacturer's operating and maintenance instructions, catalog brochure information, replacement parts lists, name, address and telephone number of nearest stocking supply house.

E. Drawings shall be neatly folded to approximately 8-1/2" x 11" size and inserted individually into 8-1/2" x 11" sheet protectors which shall be properly punched and inserted into the binder.

F. All material relative to the equipment for one system (i.e.; network wiring, paging, local sound systems, etc.) shall be filed behind a clearly labeled filing tab. The following information shall be typed on the filing tab page: Item, Manufacturer, Contractor's Order Number, Supplier's Order Number, Manufacturer's Order Number.

G. Three completed files shall be submitted for review prior to job completion. Final payments will not be certified until the maintenance manuals have been received and reviewed.

H. Authorized manufacturer's personnel shall instruct (to the Owner's satisfaction) all personnel designated by the Owner in the use of equipment and systems as listed in the section entitled "Submittals".

I. Provide a minimum of two man days in two trips to the job before the job is accepted for the instruction and training of the Owner's representative in the operation and maintenance of the complete communication system.

J. The above does not relieve the contractor of his responsibility of making service calls due to any defect which may develop with systems or equipment during the guarantee period nor shall

these service calls be included as part of instruction time. Specific requirements in specifications for factor service representatives is also in addition to above requirements.

3.15 CLEANING UP

A. Before work can be considered complete, clean all surfaces of all paint, plaster, mortar, labels and other stains and remove all lumps of cement. Take care not to scratch, mar, or damaged surfaces in cleaning.

B. In case of dispute, the Owner / User may remove the rubbish and charge the cost to the one or more contractors as the Architect / Engineer may determine to be just.

3.16 TOUCH-UP PAINTING

A. Comply with requirements in Division 9 Painting Sections for cleaning and touch-up painting.

B. All factory applied paint finishes on all communication devices and equipment that is scratched or damaged shall be touched up with rust inhibitive paint to match factory applied paint.

END OF SECTION

SECTION 27 0526

GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the technology drawings:

1) Grounding conductors.
2) Grounding connectors.
3) Grounding busbars.
4) Grounding labeling.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the technology drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the technology drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 26 0526 – Grounding and Bonding for Electrical Systems for grounding and bonding systems and equipment plus special applications underground distribution grounding, ground bonding common with lightning protection system and foundation steel electrodes.

1.3 DEFINITIONS

A. BCT: Bonding conductor for telecommunications.

B. TGB: Telecommunications grounding busbar.

C. TMGB: Telecommunications main grounding busbar.

D. Service Provider: The operator of a service that provides telecommunications transmission delivered over access provider facilities.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installation supervisor, and field inspector.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Installation Supervision: Installation shall be under the direct supervision of BICSI Technician Level Installer, who shall be present at all times when Work of this Section is performed at Project site.
2. Field Inspector: Currently registered by BICSI as a designer RCDD to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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.

B. Comply with UL 467 for grounding and bonding materials and equipment.

C. Comply with TIA-607-B.

2.2 CONDUCTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. General Cable; General Cable Corporation.
2. Senator Wire & Cable Company.
3. Southwire Company.
4. Nexans.
5. Republic Wire, Inc.

B. Comply with UL 486A-486B.

C. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.

D. Bare Copper Conductors:

1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.
3. Tinned Conductors: ASTM B33.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.3 CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chatsworth Products, Inc.
2. Harger Lightning & Grounding.
3. Hubbell Incorporated (Construction and Energy Group).
4. Panduit Corp.

B. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

C. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

1. Electroplated tinned copper, C and H shaped.

D. Busbar Connectors: Cast silicon bronze, solderless compression-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch centers for a two-bolt connection to the busbar.

E. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING BUSBARS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chatsworth Products, Inc.
2. Harger Lightning & Grounding.
3. Panduit Corp.

B. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4 by 4 inches by 20 inches. The busbar shall be NRTL listed for use as TMGB and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide a 4-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

C. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches by 12 inches. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

D. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-607-B. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
2. Rack-Mounted Vertical Busbar: 72 or 36 inches long, with stainless-steel or copper-plated hardware for attachment to the rack.

2.5 IDENTIFICATION

A. Comply with requirements for identification products in Section 27 0553 "Identification for Communications Systems."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.

B. Comply with NECA 1.

C. Comply with TIA-607-B.

3.2 APPLICATION

A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.

2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.

B. Conductor Terminations and Connections:

1. Connections to Structural Steel: Welded connectors.

C. Conductor Support:

1. Secure grounding and bonding conductors at intervals of not less than 36 inches.

D. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch intervals.
4. Install grounding and bonding conductors in 3/4-inch PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements in Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a TGB.

3.3 GROUNDING BUSBARS

A. Install busbars horizontally, 12 inches above finished floor unless otherwise indicated.

3.4 CONNECTIONS

A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.

B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
2. Pretwist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

D. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications backbone conductor. The telecommunications backbone conductor size shall be No. 3/0 AWG unless otherwise indicated.

E. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install rack grounding

busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.

F. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.

G. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.

H. Shielded Cable: Bond the shield of shielded cable to the TGB in communications rooms and spaces. Comply with TIA-568-C.1 and TIA-568-C.2 when grounding shielded balanced twisted-pair cables.

I. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

3.5 IDENTIFICATION

A. Labels shall be preprinted or computer-printed type.

1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.
2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

END OF SECTION

SECTION 27 0528

PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the technology drawings:

1) Metal conduits and fittings.
2) Nonmetallic conduits and fittings.
3) Metallic surface pathways.
4) Hooks.
5) Boxes, enclosures, and cabinets.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the technology drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the technology drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 26 0533 – Raceways and Boxes for Electrical Systems for metal conduits, tubing and fittings, nonmetal conduits, tubing and fittings, surface raceways, boxes, enclosures and cabinets, handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. GRC: Galvanized rigid conduit.

1.4 ACTION SUBMITTALS

A. Product data for the following:

1. Surface pathways
2. Boxes, enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Description: Metal raceway of circular cross section with manufacturer-fabricated fittings.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Tube & Conduit; a part of Atkore International.
2. Republic Conduit.
3. Western Tube and Conduit Corporation.

C. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
2. Comply with TIA-569-D.

D. GRC: Comply with ANSI C80.1 and UL 6.

E. EMT: Comply with ANSI C80.3 and UL 797.

F. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Fittings for EMT:

a. Material: Steel.
b. Type: Compression.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

G. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS

A. Description: Comply with UL 2024; flexible-type pathway with a circular cross section, approved for plenum riser or general-use installation as required.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire.
2. Carlon; a brand of Thomas & Betts Corporation.
3. Dura-Line.
4. Endot Industries Inc.

C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with TIA-569-D.

2.3 SURFACE METAL PATHWAYS

A. Description: Galvanized steel with snap-on covers, complying with UL 5.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. MonoSystems, Inc.
2. Niedax Inc.
3. Panduit Corp.

C. Finish: Manufacturer's standard enamel finish in color selected by Architect.

D. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

E. Comply with TIA-569-D.

2.4 HOOKS

A. Description: Prefabricated sheet metal cable supports for telecommunications cable.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. MonoSystems, Inc.
2. Panduit Corp.

C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with TIA-569-D.

E. Galvanized steel.

F. J shape.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Description: Enclosures for communications.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Crouse-Hinds, an Eaton business.
2. Hubbell Incorporated.
3. MonoSystems, Inc.
4. Thomas & Betts Corporation; A Member of the ABB Group.

C. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569-D.
2. Boxes, enclosures, and cabinets installed in wet locations shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for use in wet locations.
3. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
4. Device Box Dimensions: 4 inches square by 2-1/8 inches deep unless noted otherwise on drawings.
5. Gangable boxes are prohibited unless noted otherwise on drawings.

D. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Large Capacity Wall Boxes:

1. Four-inch-deep gangable steel junction box.
2. Multiple knock-outs: ½", ¾", 1", 1-1/4", 1-1/2" & 2".
3. Dividable with separate divider plate.
4. Model:

a. Two-Gang: Hubbell #HBL985
b. Three-Gang: Hubbell #HBL986
c. Four-Gang: Hubbell #HBL987

G. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

H. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.6 BOX FOR FLAT PANEL DISPLAY

A. Recessed, steel box with paintable white trim plate.

B. Box shall have divider plates for simultaneous line- and low-voltage installations.

C. Installation:

1. Box shall be suitable for new and existing construction.
2. Box shall have ability to be screw to wood or metal studs for new-construction installations.
3. Box shall be equipped with mounting wings to securely hold boxes in wall for existing-construction installations.

D. Box shall be UL listed.

E. Box shall be:

1. Arlington Industries, Inc. # TVBS505 or similar for two-gang box.
2. Arlington Industries, Inc. # TVBS507 or similar for three-gang box.
3. Arlington Industries, Inc. # TVBS613 or similar for four-gang box.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.

B. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage and Not Exposed to Inmates Not Accompanied by Jail Staff: EMT.
2. Exposed and Exposed to Inmates Not Accompanied by Jail Staff: GRC.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Damp or Wet Locations: GRC.
5. Pathways for Optical-Fiber Concealed Above Ceiling in Existing Jail: Communications-cable pathway.
6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 nonmetallic units in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size: 3/4-inch trade size for copper and aluminum cables, and 1 inch for optical-fiber cables.

D. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.

3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.

E. Install surface pathways only where indicated on Drawings.

F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA/BICSI 568.
3. TIA-569-D.
4. NECA 101

B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

C. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

D. Comply with requirements in Section 270529 "Hangers and Supports for Communications Systems" for hangers and supports.

E. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling" for sleeves and sleeve seals for communications.

F. Conduits and raceways shall not be supported from plumbing lines, ductwork or supports for equipment provided by other trades.

G. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

H. Complete pathway installation before starting conductor installation.

I. Arrange stub-ups so curved portions of bends are not visible above finished slab.

J. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.

K. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines. In mechanical equipment rooms, conduit may be exposed at the ceiling or on the walls.

L. Support conduit within 12 inches of enclosures to which attached.

M. Raceways Embedded in Slabs:

1. There shall not be any raceways installed horizontally in concrete slabs throughout the building, except where specifically noted and detailed on the drawings.

N. Stub-ups to Above Recessed Ceilings:

1. Use EMT or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

O. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

P. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

Q. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

R. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus one additional quarter-turn.

S. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.

T. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

U. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.

V. Surface Pathways:

1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
2. Install surface pathway with a minimum 2-inch radius control at bend points.
3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

W. Pathways for Optical-Fiber Cable: Install as follows:

1. 3/4-Inch Trade Size and Smaller: Install pathways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.
3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

X. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

Y. Expansion-Joint Fittings:

1. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
d. Attics: 135 deg F temperature change.

2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
3. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
4. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

Z. Hooks:

1. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.
2. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
3. Hook spacing shall allow no more than 6 inches of slack. The lowest point of the cables shall be no less than 6 inches adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
4. Space hooks no more than 5 feet o.c.
5. Provide a hook at each change in direction.

AA. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

BB. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

CC. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

DD. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

EE. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 27 0529

HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the technology drawings:

1) Steel slotted support systems for communication raceways.
2) Conduit and cable support devices.
3) Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the technology drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the technology drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 26 0529 – Hangers and Supports for Electrical Systems for hangers and supports for electrical equipment and systems, construction requirements for concrete bases.
2. Section 27 0548 – Seismic Seismic Controls for Communications Systems for products and installation requirements necessary for compliance with seismic criteria.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities and furnished specialties and accessories.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. B-line, an Eaton business.
b. Flex-Strut Inc.
c. Unistrut; Part of Atkore International.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Material for Channel, Fittings, and Accessories: Galvanized steel.
4. Channel Width: 1-5/8 inches.
5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
9. Channel Dimensions: Selected for applicable load criteria.

B. Conduit and Cable Support Devices: Steel clamps, hangers, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored communications conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Anchors using explosive charges to drive inserts into concrete shall not be used.
2. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) B-line, an Eaton business.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti, Inc.
4) ITW Ramset/Red Head; Illinois Tool Works, Inc.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M,Grade A325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA/BICSI 568.
3. TIA-569-D.
4. NECA 101.

B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other]support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, according to NFPA 70.

B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten communications items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Use approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Use expansion anchor fasteners.
5. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION

SECTION 27 0544

SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the technology drawings:

1) Round sleeves.
2) Sleeve seal systems.
3) Grout.
4) Foam sealants.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the technology drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the technology drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 07 8413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ROUND SLEEVES

A. Wall Sleeves, Steel:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Advance Products & Systems, LLC.
   b. CCI Piping Systems.
   c. Flexicraft Industries.

2. Description: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.

B. Sheet Metal Sleeves, Galvanized Steel, Round:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Benefast.

2. Description: Galvanized-steel sheet; thickness not less than 0.0239-inch; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.2 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.3 FOAM SEALANTS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Dow Chemical Company (The).

B. Description: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam. Foam expansion must not damage cables or crack penetrated structure.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

    a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
    b. Seal annular space between sleeve and pathway or cable, using foam sealant appropriate for size, depth, and location of joint.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide [**1/4-inch**] <**Insert dimension**> annular clear space between sleeve and pathway or cable, unless sleeve seal system is to be installed[**or seismic criteria require different clearance**].
4. Install sleeves for all wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

5. Install sleeves for floor penetrations. Extend sleeves installed in floors [**2 inches**] <**Insert dimension**> above finished floor level. Install sleeves during erection of floors.

C. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for wall assemblies.

D. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

E. Sleeves for Conduits Penetrating Above-Grade Fire-Rated Walls:

1. Interior Penetrations of Fire-Rated Walls and Floors:

    a. Seal annular space between sleeve and raceway or cable, using appropriate fire stop material such as 3M fire barrier CD 24WB+ or similar appropriate for size, depth, and location of joint.
    b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
4. Install sleeves for all wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

END OF SECTION

SECTION 27 0553

IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the technology drawings:

1) Color and legend requirements for labels and signs.
2) Labels.
3) Signs.
4) Fasteners for labels and signs.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the technology drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the technology drawings.

1.2 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 communications identification products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70 and TIA 606-B.

B. Comply with ANSI Z535.4 for safety signs and labels.

C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Equipment Identification Labels:

1. Black letters on a white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Champion America.
c. LEM Products Inc.
d. Panduit Corp.

2.4 SIGNS

A. Laminated-Acrylic or Melamine-Plastic Signs:

1. Engraved legend.
2. Thickness:

a. For signs up to 20 sq. in., minimum 1/16 inch thick.
b. For signs larger than 20 sq. in., 1/8 inch thick.
c. Engraved legend with black letters on white face.
d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.
e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.

G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

H. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
3. Provide label 6 inches from cable end.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.

C. Faceplates: Label individual jacks within each faceplates with self-adhesive labels. Each faceplate shall be labeled with circuit as shown on plan.

D. Equipment Room Labeling:

1. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels containing equipment designation.
2. Patch Panels: Label individual rows and outlets, starting at to left and working down, with self-adhesive labels.

E. Backbone Cables: Label each cable with a vinyl-wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.

F. Horizontal Cables: Label each cable with a vinyl-wraparound labeling circuit as shown on plans.

G. Equipment Identification Labels:

1. Indoor Equipment: Laminated-acrylic or melamine-plastic sign.
2. Equipment to Be Labeled:

    a. Communications cabinets and racks.

END OF SECTION

SECTION 27 1100

COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the technology drawings:

1) Backboards.
2) Boxes, enclosures, and cabinets.
3) Power strips.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the technology drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the technology drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 27 1323 "Communications Optical Fiber Backbone Cabling" for optical-fiber data cabling associated with system panels and devices.
2. Section 27 1513 "Communications Copper Horizontal Cabling" for copper data cabling associated with system panels and devices.

1.3 DEFINITIONS

A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.

B. BICSI: Building Industry Consulting Service International.

C. RCDD: Registered communications distribution designer.

D. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.

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 equipment racks and cabinets.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

PART 2 - PRODUCTS

2.1 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches.

B. Backboard Paint: Light-colored interior latex paint.

2.2 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Incorporated.
2. MonoSystems, Inc.
3. Spring City Electrical Manufacturing Company.
4. Thomas & Betts Corporation; A Member of the ABB Group.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets shall be listed and labeled for intended location and use.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

E. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

F. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

G. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

H. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.

2.3 POWER STRIPS

A. Comply with requirements in Section 271116 "Communications Racks, Frames, and Enclosures."

B. Power Strips: Comply with UL 1363.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Rack mounting, with integral flanges.
3. Height: 1 RU.
4. Housing: Metal Insert material.
5. Six Insert number, 15-A, 120-V ac, NEMA WD 6, Configuration 5-15R 20-A, 120-V ac, NEMA WD 6, Configuration 5-20R receptacles.
6. Rear-facing receptacles.
7. LED indicator lights for power and protection status.
8. LED indicator lights for reverse polarity and open outlet ground.
9. Cord connected with 15-foot line cord.
10. Rocker-type on-off switch, illuminated when in on position.
11. Surge Protection: UL 1449, Type 3.

    a. Maximum Surge Current, Line to Neutral: 27 kA.
    b. Protection modes shall be line to neutral, line to ground, and neutral to ground.
    c. UL 1449 Voltage Protection Rating for line to neutral and line to ground shall be 600 V and 500 V. for neutral to ground.

2.4 POWER DISTRIBUTION UNITS – RACK MOUNTED

A. MANUFACTURERS

1. Eaton
2. Schneider Electric
3. Legrand

B. Features:

1. Color-coded outlet sections
2. Rack mountable

C. Orientation: Vertical

D. Input

1. Voltage: 208V, Single-Phase
2. Plug: NEMA L6-30P

E. Outputs

1. Voltage: 120V, Single-Phase
2. Plugs: 24 5-20R
3. Current Rating: 24A

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI's "Telecommunications Distribution Methods Manual" for layout of communications equipment spaces.

C. Comply with BICSI's "Information Technology Systems Installation Methods Manual" for installation of equipment in communications equipment spaces.

D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Coordinate layout and installation of communications equipment in tracks and in room. Coordinate service entrance configuration with service provider.

1. Meet jointly with systems providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize configurations and space requirements of communications equipment.
4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.

F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

G. Backboards:

1. Install from 6 inches to 8 feet, 6 inches above finished floor. If plywood is fire rated, ensure that fire-rating stamp is visible after installation.
2. Paint all sides of backboard with two coats of paint, leaving fire rating stamp visible.
3. Comply with requirements for backboard installation in BICSI's "Information Technology Systems Installation Methods Manual" and TIA-569-D.

END OF SECTION

SECTION 27 1116

COMMUNICATIONS RACKS, FRAMES, AND ENCLOSURES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the technology drawings:

1) 19-inch equipment racks.
2) 19-inch freestanding and wall-mounted equipment cabinets.
3) Grounding.
4) Labeling.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the technology drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the technology drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 27 1110 "Communications Equipment Room Fittings" for backboards and accessories.
2. Section 27 1323 "Communications Optical Fiber Backbone Cabling" for optical-fiber data cabling associated with system panels and devices.
3. Section 27 1513 "Communications Copper Horizontal Cabling" for copper data cabling associated with system panels and devices.

1.3 DEFINITIONS

A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.

B. BICSI: Building Industry Consulting Service International.

C. LAN: Local area network.

D. RCDD: Registered communications distribution designer.

E. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.

F. TGB: Telecommunications grounding bus bar.

G. TMGB: Telecommunications main grounding bus bar.

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 equipment racks and cabinets.
2. Include rated capacities, operating characteristics, electrical characteristics, certifications, standards compliance, and furnished specialties and accessories.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. UL listed.

B. RoHS compliant.

2.2 19-INCH EQUIPMENT RACKS

A. Description: Two- post racks with threaded rails designed for mounting telecommunications equipment. Width is compatible with EIA/ECIA 310-E, 19-inch equipment mounting with an opening of 17.72-inches between rails.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden Inc.
2. CommScope, Inc.
3. Hubbell Premise Wiring.
4. Legrand NA (Middle Atlantic Products Division).
5. Panduit Corp.

C. General Requirements:

1. Frames: Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
2. Material: Steel.
3. Finish: Manufacturer's standard, baked-polyester powder coat.
4. Color: Black.

D. Floor-Mounted Racks (two-post racks):

1. Load Rating: 1000 lb.
2. Number of Rack Units per Rack: 45.

    a. Numbering: Every five rack units, on interior of rack.

3. Threads: 12-24.
4. Vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug.
5. Base shall have a minimum of four mounting holes for permanent attachment to floor.
6. Top shall have provisions for attaching to cable tray or ceiling.
7. Self-leveling.

E. Wall-Mounted Racks:

1. Depth: 23 inches.
2. Load Rating: 200 lb.
3. Number of Rack Units per Rack: 12.
4. Threads: 12-24.
5. Wall Attachment: Four mounting holes.

F. Cable Management:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.
4. Provide horizontal crossover cable manager at the top of each relay rack, with a minimum height of two rack units each.

2.3 19-INCH EQUIPMENT CABINETS

A. Description: Manufacturer-assembled four-post frame enclosed by side and top panels and front and rear doors, designed for mounting telecommunications equipment. Width is compatible with EIA/ECIA 310-E, 19-inch equipment mounting with an opening of 17.72 inches between rails.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden Inc.
2. CommScope, Inc.
3. Hubbell Premise Wiring.
4. Legrand NA (Middle Atlantic Products Division).
5. Panduit Corp.

C. General Cabinet Requirements:

1. Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
2. Material: Steel.
3. Finish: Manufacturer's standard, baked-polyester powder coat.
4. Color: Black.

D. Modular Freestanding Cabinets:

1. Overall Depth: 29 inches.
2. Load Rating: 3000 lb.
3. Number of Rack Units: 45.

    a. Numbering: Every five rack units, on interior of rack.

4. Threads: 12-24.
5. Removable and lockable side and top panels.
6. Bi-folding, hinged and lockable front and rear doors. Large Single Doors not allowed.
7. Adjustable feet for leveling.
8. Screened ventilation openings in roof and rear door.
9. Cable access provisions in roof and base.
10. TGB.
11. Roof-mounted, 550-cfm fan with filter.
12. All cabinets keyed alike.

E. Modular Wall Cabinets:

1. Depth: 29 inches.
2. Load Rating: 200 lb.
3. Number of Rack Units: 18.
4. Threads: 12-24.
5. Lockable front doors.
6. Louvered side panels.
7. Cable access provisions top and bottom.
8. Grounding lug.
9. Roof-mounted, 250-cfm fan.
10. All cabinets keyed alike.

F. Cable Management:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.
4. Provide horizontal crossover cable manager at top of each relay rack, with a minimum height of two rack units each.

2.4 GROUNDING

A. Rack and Cabinet TGBs: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-606-B. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted TGB: Terminal block, with stainless-steel or copper-plated hardware for attachment to cabinet.
2. Rack-Mounted Horizontal TGB: Designed for mounting in 19- or 23-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical TGB: 72 or 36 inches long, with stainless-steel or copper-plated hardware for attachment to rack.

B. Bond rack-mounted TGB to IDF / MDF ground bar with #3/0 AWG copper conductor.

2.5 LABELING

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI TDMM for layout of communications equipment spaces.

C. Comply with BICSI ITSIMM for installation of communications equipment spaces.

D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Coordinate layout and installation of communications equipment in racks and room. Coordinate service entrance configuration with service provider.

1. Meet jointly with system providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment spaces to accommodate and optimize configuration and space requirements of telecommunications equipment.
4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.

F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3.2 GROUNDING

A. Comply with NECA/BICSI 607.

B. Install grounding according to BICSI ITSIMM, "Bonding, Grounding (Earthing) and Electrical Protection" Ch.

C. Locate TGB to minimize length of bonding conductors. Fasten to wall, allowing at least 2 inches of clearance behind TGB. Connect TGB with a minimum No. 4 AWG grounding electrode conductor to network cabinet / rack.

1. Bond the shield of shielded cable to patch panel, and bond patch panel to TGB or TMGB.

3.3 IDENTIFICATION

A. Coordinate system components, wiring, and cabling complying with TIA-606-B. Comply with requirements in Section 270553 "Identification for Electrical Systems."

B. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

C. Labels shall be machine printed.

END OF SECTION

SECTION 27 1323

COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the technology drawings:

1) 850 nanometer laser-optimized 50/125 micrometer multimode optical fiber cable (OM3).
2) 9/125 micrometer single-mode, indoor-outdoor optical fiber cable (OS2).
3) Optical fiber cable connecting hardware, patch panels, and cross-connects.
4) Cabling identification products.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the technology drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the technology drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 27 1100 – Communications Equipment Room Fittings for backboards, boxes, enclosures and cabinets, power strips.
2. Section 27 1116 – Communications Racks, Frames and Enclosures for 19-inch equipment racks, 19-inch freestanding and wall-mounted equipment cabinets, grounding, labeling.
3. Section 27 1513 – Communications Copper Horizontal Cabling for category 6a twisted pair cable, twisted pair cable hardware, including plugs and jacks, cabling identification products, grounding provisions for twisted pair cable.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. RCDD: Registered Communications Distribution Designer.

1.4 OPTICAL FIBER BACKBONE CABLING DESCRIPTION

A. Optical fiber backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For RCDD, Installer, installation supervisor, and field inspector.

B. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For optical fiber cable, splices, and connectors to include in maintenance manuals.

1.8 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. Patch-Panel Units: One of each type.
2. Plugs: Ten of each type.
3. Jacks: Ten of each type.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.

B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical fiber flashlight or optical loss test set.
2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.

1.11 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.12 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's IT Staff.

1.13 WARRANTY

A. Provide a comprehensive cable/premise wiring device warranty from manufacturer of communication device system for no less than 25 years. This shall include a warranty on all parts and labor:

1. The cabling/premise wiring device warranty and system performance guarantee program shall warrant the structured cabling system is free from defects in material and workmanship and will support any current or future Category-6A system applications ratified by IEEE, ANSI or ISO that is developed for an ANSI/TIA/EIA-568-D compliant structured cabling system for a 25-year period from date of registered installation. This warranty shall also include a warranty covering all components (work area outlets, horizontal cable, connecting hardware in the horizontal cross-connect, the equipment cord at the work area, and the patch cord in the horizontal cross-connect). All devices must be manufactured by warranty provider.
2. Contractor must be a Certified Installer and accredited Certified Installer for the manufacturer of product being installed, as approved by Owner.

B. Provide a one (1) year warranty on all other associated equipment not covered under warranty indicated above.

C. The contractor shall provide a minimum one (1) year warranty for all parts and labor on each phase of construction, based upon the substantial completion date established for each phase of construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

2.2 850 NANOMETER LASER-OPTIMIZED, 50/125 MICROMETER, MULTIMODE OPTICAL FIBER CABLE (OM3)

A. Description: Multimode, 50/125-micrometer, 12-fiber, nonconductive, tight buffer, optical fiber cable.

B. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Belden CDT Networking Division/NORDX.
2. CommScope, Inc.
3. Corning Cable Systems.

C. Standards:

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA-568-C.3 for performance specifications.
3. Comply with TIA-492AAAC for detailed specifications.

D. Conductive cable shall be aluminum armored type.

E. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.

F. Minimum Overfilled Modal Bandwidth-length Product: 1500 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

G. Minimum Effective Modal Bandwidth-length Product: 2000 MHz-km at 850 nm.

H. Jacket:

1. Jacket Color: Aqua.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

I. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

1. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.

2.3 9/125 MICROMETER, SINGLE-MODE, INDOOR OPTICAL FIBER CABLE (OS2)

A. Description: Single mode, 9/125-micrometer, 12 fibers, tight buttered, unarmored optical fiber cable.

B. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Belden CDT Networking Division/NORDX.
2. CommScope, Inc.
3. Corning Cable Systems.

C. Standards:

1. Comply with TIA-492CAAB for detailed specifications.
2. Comply with TIA-568-C.3 for performance specifications.
3. Comply with ICEA S-104-696 for mechanical properties.
4. Comply with ITU-T G-652.D for reduced water peak single mode fibers.
5. Comply with ITU-T G-657.A1 for improved bond performance.

D. Maximum Attenuation: 0.35 dB/km at 1310 nm; 0.25 dB/km at 1550 nm.

E. Jacket:

1. Jacket Color: Black.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

F. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

1. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.

2.4 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Belden CDT Networking Division/NORDX.
2. CommScope.
3. Corning Cable Systems.

B. Standards:

1. Comply with Fiber Optic Connector Intermateability Standard (FOCIS) specifications of the TIA-604 series.
2. Comply with TIA-568-C.3.

C. Patch Panels: Modular panels housing multiple-numbered, duplex MM, LC cable connectors with clear glass door and sliding interior tray.

1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria

D. Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths.

E. Connector Type: Type LC complying with TIA-604-10-B, connectors.

F. Plugs and Plug Assemblies:

1. Male; color-coded modular telecommunications connector designed for termination of a single optical fiber cable.
2. Insertion loss not more than 0.75 dB.
3. Marked to indicate transmission performance.

G. Jacks and Jack Assemblies:

1. Female; quick-connect, simplex and duplex; fixed telecommunications connector designed for termination of a single optical fiber cable.
2. Insertion loss not more than 0.75 dB.

2.5 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with TIA-607-B.

2.6 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

3.2 WIRING METHODS

A. Wiring Method:

1. Free-air cable installation:

a. Free-air installation shall not be permitted.

2. Non-free-air cable installation:

a. Non-free-air installation shall be required.
b. Cables shall be required to be installed in conduit except in data rooms.

B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF OPTICAL FIBER BACKBONE CABLES

A. Comply with NECA 1, NECA 301, and NECA/BICSI 568.

B. Examine pathway elements intended for cables.

1. Verify proposed routes of pathways. Check raceways and other elements for compliance with space allocations, clearances, installation tolerances, hazards to cable installation, and other conditions affecting installation. Verify that cabling can be installed complying with EMI clearance requirements. Proceed with installation only after unsatisfactory conditions have been corrected.
2. Prepare wall penetrations and verify that penetrations of rated fire walls are made using products labeled for type of wall penetrated.
3. Identify plan to support raceways. Verify weight of individual types and sizes of cables. Verify that load capacity of cable support structures is adequate for each pathway.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Verify that surfaces are ready and clean to receive work.

D. Verify that quantity and sizes of boxes/conduit are acceptable for installation of jacks and cabling.

E. Make general contractor and architect aware of any condition on-site that may interfere or cause damage to installation of system.

F. Beginning installation means installer accepts existing conditions.

G. Installer shall coordinate work with all tradesmen.

H. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.

I. Comply with TIA/EIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.

J. Comply with requirements in Division 26 Sections for installation of conduits and wireways.

K. General Requirements for Optical Fiber Cabling Installation:

1. Comply with TIA-568-C.1 and TIA-568-C.3.
2. Comply with BICSI ITSIMM, Ch. 6, "Cable Termination Practices."
3. Terminate all cables; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

6. Bundle, lace, and train cable to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
9. In the communications equipment room, provide a 10-foot-long service loop on each end of cable.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
11. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI ITSIMM, "Firestopping" Chapter.

3.5 GROUNDING

A. Install grounding according to BICSI ITSIMM, "Grounding (Earthing), Bonding, and Electrical Protection" Chapter.

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

B. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606-B, for the following:

1. Flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Optical Fiber Cable Tests:

    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    b. Link End-to-End Attenuation Tests:

        1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in one direction according to TIA-526-14-B, Method B, One Reference Jumper.
        2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than those calculated according to equation in TIA-568-C.1.

C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

D. Remove and replace cabling where test results indicate that it does not comply with specified requirements.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION

SECTION 27 1513

COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the technology drawings:

1) Category 6a twisted pair cable.
2) Twisted pair cable hardware, including plugs and jacks.
3) Cabling identification products.
4) Grounding provisions for twisted pair cable.

b. System shall be a complete operational 10 GIG, Category-6A local area network data cabling system, with a 10 GIG fiber optic backbone, excluding active devices. System shall be certified to this degree.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the technology drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the technology drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 27 1100 – Communications Equipment Room Fittings for backboards, boxes, enclosures and cabinets, power strips.
2. Section 27 1116 – Communications Racks, Frames and Enclosures for 19-inch equipment racks, 19-inch freestanding and wall-mounted equipment cabinets, grounding, labeling.

3. Section 27 1323 – Communications Optical Fiber Backbone Cabling for 850 nanometer laser-optimized 50/125 micrometer multimode optical fiber cable (OM3), 9/125 micrometer single-mode, indoor-outdoor optical fiber cable (OS2), optical fiber cable connecting hardware, patch panels, and cross-connects, cabling identification products.

1.3 DEFINITIONS

A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

B. EMI: Electromagnetic interference.

C. FTP: Shielded twisted pair.

D. F/FTP: Overall foil screened cable with foil screened twisted pair.

E. F/UTP: Overall foil screened cable with unscreened twisted pair.

F. IDC: Insulation displacement connector.

G. LAN: Local area network.

H. Jack: Also commonly called an "outlet," it is the fixed, female connector.

I. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.

J. RCDD: Registered Communications Distribution Designer.

K. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

L. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

M. S/FTP: Overall braid screened cable with foil screened twisted pair.

N. S/UTP: Overall braid screened cable with unscreened twisted pairs.

O. UTP: Unscreened (unshielded) twisted pair.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For RCDD, Installer, installation supervisor, and field inspector.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.7 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. Connecting Blocks: One of each type.
2. Faceplates: One of each type.
3. Jacks: Ten of each type.
4. Patch-Panel Units: One of each type.
5. Plugs: Ten of each type.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings, cabling administration Drawings, and field-testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.

B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.11 WARRANTY

A. Provide a comprehensive cable/premise wiring device warranty from manufacturer of communication device system for no less than 25 years. This shall include a warranty on all parts and labor:

1. The cabling/premise wiring device warranty and system performance guarantee program shall warrant the structured cabling system is free from defects in material and workmanship and will support any current or future Category-6A system applications ratified by IEEE, ANSI or ISO that is developed for an ANSI/TIA/EIA-568-D compliant

structured cabling system for a 25-year period from date of registered installation. This warranty shall also include a warranty covering all components (work area outlets, horizontal cable, connecting hardware in the horizontal cross-connect, the equipment cord at the work area, and the patch cord in the horizontal cross-connect). All devices must be manufactured by warranty provider.

2. Contractor must be a Certified Installer and accredited Certified Installer for the manufacturer of product being installed, as approved by Owner.

B. Provide a one (1) year warranty on all other associated equipment not covered under warranty indicated above.

C. The contractor shall provide a minimum one (1) year warranty for all parts and labor on each phase of construction, based upon the substantial completion date established for each phase of construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:

1. Communications, Plenum Rated: Type CMP complying with UL 1685.

B. RoHS compliant.

2.3 CATEGORY 6a TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6a cable at frequencies up to 500MHz.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden CDT Networking Division/NORDX.
2. CommScope, Inc.
3. Berk-Tech, Inc.

C. Standard: Comply with TIA-568-C.2 for Category 6a cables.

D. Conductors: 100-ohm, 23 AWG solid copper.

E. Shielding/Screening: Unshielded twisted pairs (UTP).

F. Cable Rating: Plenum.

G. Jacket: PVC.

1. Network: Blue.
2. Wireless Access Points: Green.
3. VoIP Phone: Orange.

H. Cable shall meet or exceed the following standards:

1. ANSI/TIA-568-C.2 and ISO/IEC 11801 component compliance.
2. IEEE 802.3af (PoE), IEEE 802.3at (PoE+), IEEE 802.3bt (4PPoE Type 3 and 4).
3. 10BASE-T through 10GBASE-T Ethernet at 100 meters and PoE+ and PoE++.
4. NEC Article 800 compliant.
5. Third party verified.
6. UL/c (UL) Listed, LP Listed for product safety in high heat/high power PoE+ and PoE++ applications.
7. HDASE-T Certified
8. RoHS/RoHS 2 Compliant.
9. REACH Compliant.
10. IEEE 802.11ac high bandwidth/high power wireless access point applications.
11. Tested to 100 watts.

2.4 TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. General Requirements for Twisted Pair Cable Hardware:

1. Comply with the performance requirements of Category 6a.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

C. Source Limitations: Obtain twisted pair cable hardware from same manufacturer as twisted pair cable, from single source.

D. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.
d. 24 or 48 ports.

2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.

E. Patch Cords: Factory-made, four-pair cables in 12-inch lengths; terminated with an eight-position modular plug at each end.

1. Provide one patch cord for each terminated horizontal cable.
2. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
3. Patch cords shall have color-coded boots for circuit identification.

F. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Standard: Comply with TIA-568-C.2.

G. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standard: Comply with TIA-568-C.2.
4. Color to match cable color.

H. Faceplate:

1. Four port, vertical single gang faceplates designed to mount to single gang wall boxes.
2. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
3. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.

I. Legend:

1. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with TIA-607-B.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method:

1. Free-air cable installation:

a. Free-air installation shall not be permitted.

2. Non-free-air cable installation:

a. Non-free-air installation shall be required.
b. Cables shall be required to be installed in conduit except in data rooms.

B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF PATHWAYS

A. Comply with requirements for demarcation point, cabinets, and racks specified in Section 27 1100 "Communications Equipment Room Fittings."

B. Comply with Section 27 0528 "Pathways for Communications Systems."

3.3 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. Examine pathway elements intended for cables.

1. Verify proposed routes of pathways. Check raceways, cable trays, and other elements for compliance with space allocations, clearances, installation tolerances, hazards to cable installation, and other conditions affecting installation. Verify that cabling can be installed complying with EMI clearance requirements. Proceed with installation only after unsatisfactory conditions have been corrected.
2. Prepare wall penetrations and verify that penetrations of rated fire walls are made using products labeled for type of wall penetrated.
3. Identify plan to support cables and raceways in suspended ceilings. Verify weight of individual types and sizes of cables. Verify that load capacity of cable support structures is adequate for each pathway.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Verify that surfaces are ready and clean to receive work.

D. Verify that quantity and sizes of boxes/conduit are acceptable for installation of jacks and cabling.

E. Make general contractor and architect aware of any condition on-site that may interfere or cause damage to installation of system.

F. Beginning installation means installer accepts existing conditions.

G. Installer shall coordinate work with all tradesmen.

H. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.

I. Comply with TIA/EIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.

J. Comply with requirements in Division 26 Sections for installation of conduits and wireways.

K. General Requirements for Cabling:

1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
2. Comply with BICSI's "Information Transport Systems Installation Methods Manual (ITSIMM), Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. MUTOA shall not be used as a cross-connect point.
7. Consolidation points may be used only for making a direct connection to equipment outlets:

    a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
    b. Locate consolidation points for twisted-pair cables at least 49 feet from communications equipment room.

8. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
9. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
10. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI Information Transport Systems Installation Methods Manual , Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
11. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.
12. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
13. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
14. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

L. Group connecting hardware for cables into separate logical fields.

3.4 FIRESTOPPING

A. Comply with requirements in Section 07 8413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with "Firestopping Systems" Article in BISCI's "Telecommunications Distribution Methods Manual."

3.5 GROUNDING

A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
    b. Label each unit and field within distribution racks and frames.

3. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

B. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified

in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

D. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.

E. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

F. End-to-end cabling will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

END OF SECTION

Preliminary

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PROJECT MANUAL

CHAMPAIGN COUNTY
SATELLITE JAIL
JAIL CONSOLIDATION

ITB #2022-009 SATELITE JAIL CONSOLIDATION PROJECT

502 S. Lierman Ave.
Urbana, IL 61802

ISSUE FOR BIDS

VOLUME 5

REIFSTECK REID

DATE: SEPTEMBER 14, 2022

RRCo PROJECT #202190

PROJECT MANUAL FOR

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VOLUME 1

VOLUME 2

VOLUME 3

VOLUME 4

MEP Specifier:
GHR Engineers & Associates Inc.
1615 S. Neil Street, Champaign, IL 61820
217.356.0536

SECTION 28 0001

QUALIFICATION PROCESS FOR DIVISION 28

PART 1 GENERAL

1.01 QUALIFICATION PROCESS INCLUDES

A. The evaluation of the prospective ESSS qualifications will be based on the following proposal.
   1. The ESSS must demonstrate that they have a minimum of 10 years of experience in the field of integrated security and communication systems serving the corrections industry under the same company name.
   2. Provide an audited financial statement for the previous two (2) years.
   3. Provide a detailed description of all company ownership changes within the last 10 years. Include all information regarding the nature of ownership, the structure of the ownership group, and the breakdown of ownership percentages. Include any financing associated with private equity organizations, amount financed, duration of obligation, and terms of the obligation.
   4. Provide all company name changes within the last 15 years. Include the purpose of change.
   5. Provide the name, address, and telephone number of the organization's current Bonding Company and level of bonding capacity.
   6. Evidence that the principal members and key personnel (including project manager, on-site supervisor, system engineer, and software engineer) to be assigned to this project have a minimum of 10 years experience each in successfully completing detention projects of equal scope, listed manufacturers, quality, type, and complexity to that required herein. Include resumes of all personnel. Provide an organizational chart of the entire organization.
   7. Provide ESSS UL 508A certification. The ESSS must be able to apply the UL 508A listing mark at their facility.
   8. Provide a certificate of Technology Liability Insurance to include but not limited to third-party coverage for technology services and miscellaneous professional liability services, technology products, media content liability services, network security liability services, and privacy liability with at least a minimum for each occurrence or claim of $1,000,000.00 with a general aggregate limit of $5,000,000.00
   9. Provide evidence that the ESSS has their own custom fabrication shop in-house and shall utilize their own full-time employed engineers to manufacture all custom products.
   10. The ESSS shall have a minimum of one (1) full-time employed, Microsoft-certified engineer.
   11. Provide evidence that the system integrator has had a full-time BIM coordinator on staff for a minimum of five years. Reference a minimum of 50 projects.
   12. Provide a complete list of all completed projects in the corrections or related industry. The owner reserves the right to contact any past project references of the submitting system subcontractor even if the references are not listed as part of the technical proposal. Include the following:
       a. A description of systems included, along with a description of the level of integration.
       b. Date completed.
       c. Contract value.
       d. Owner contact and telephone number.
   13. Provide a complete list of current projects. Include the following:
       a. A description of systems included, along with a description of the level of integration.
       b. Expected date of completion.
       c. Contract value.
       d. Owner contact and telephone number.
   14. Provide a list of all projects where the ESSS provided a PROPRIETARY hardware and/or software approach. The design team defines proprietary software approaches as any software that included Video Graphic User Interface software with IO/DA servers other than Wonderware, InduSoft, or branded as the system integrator as well as any files that

include a DLL, EXE, NET, or other compiled file extension. For equipment to be considered non-proprietary it shall be manufactured by a company that has produced a product line of compatible products for at least fifteen years and shall have a minimum of two distributors (located within the state of the project but preferred to have distribution in every state in the country) with annual sales over one hundred thousand dollars. If it is found that the system integrator did not disclose projects, they will not be prequalified. Include the following information:

a. A description of all components and software provided on the project.
b. Date of completion.
c. Contract value.
d. Owner contract and telephone number.

15. Provide a list of all projects where the ESSS provided an electronic security system that included any web server, cloud-based services or require any subscription for any portion of the system to operate including but not limited to the security management system, touch screen workstation software, active directory services, password assignments, audio communication system, video management system, video management storage servers, video management system search features, active directory management on any system, access control system or other systems as specified and required.
16. List of all projects, within the last 5 years, in which the organization has been involved in litigation, been involved in a bond claim of any type, or been a part of stop-work order. If it is found that the system integrator did not disclose projects, they will not be prequalified.
17. Has the organization filed for bankruptcy protection within the last 15 years? Have any leadership personnel worked for a company that filed for bankruptcy protection?
18. Disclose all previous projects that the integrator did not complete the specified warranty or complete the system installation in its entirety.
19. Technical proposal shall also include and encompass the following:
    a. A technical description of the ESSS's approach to system design and implementation of each of the major systems. Identify all interfaces with other contractor work.
    b. Functional block diagram of the integrated system. For each system define all equipment interfaces.
    c. Specific systems equipment manufacturers, which the ESSS plans on utilizing.
    d. The system subcontractor shall provide a software data flow diagram/chart indicating in what programs and where all control logic will reside. Provide a detailed description of the software approach and provide a signed statement that all software shall be developed in the Wonderware or InduSoft environment. Subcontractors who develop logic in compiled DLL, EXE, NET files, or other encrypted as well as compiled software shall not be considered. ESSS shall provide a sample of their programming passwords and source codes to confirm their non-proprietary approach to the development of the custom software.
    e. The system manufacturer must certify that they will provide one complete software development package including a license (issued to the owner). Include all other independent development licenses such as but not limited to CCTV, audio, and card access system I/O servers utilized on the project. In addition, provide 40 hours of software programming instruction to the owner's designated representative. Programming instruction shall include a detailed explanation of how to create I/O and memory tags, icon creation, event logging, create and edit scripts, PLC modifications, and independent system programming methods (video management system, audio communication system, card access system) for all devices within the project.

f. ESSS shall provide confirmation that their electronic security system will not include any web server, cloud-based services or require any subscription for complete system operations including but not limited to the security management system, touch screen workstations, active directory services, password assignments, audio communication system, video management system, video management storage servers, video management system search features, active directory management on any system, access control system or other system as specified and required.

END OF SECTION

SECTION 28 0500

COMMON WORK RESULTS FOR DETENTION SECURITY

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the security drawings:

1) Electrical equipment coordination and installation.
2) Common electrical installation requirements.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the security drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the security drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. 28 2000 – Video Surveillance
2. 28 5200 – Security Intercommunication System
3. 28 5211 - Detention Monitoring and Control Systems Hardware
4. 28 5213 - Detention Monitoring and Control Systems Software
5. 28 5215 - Auxiliary Systems Control
6. <**List sections that require direct coordination with this section**>

B. Installed but furnished by others:

1. Related Divisions 08 Sections:

a. Prepare doors and frames for electrified hardware and devices specified in this section
b. Coordinate templates and preparation of doors and frames for electrified hardware.
c. Coordinate hardware with the requirements of this section.

2. Related Division 11 Sections:

a. Coordinate templates and preparation of doors and frames for electrified hardware.
b. Coordinate power requirements for electric hardware with the requirements of this section.
c. Prepare doors and frames for electrified hardware and devices specified in this section.

3. 26 0519 - Low-Voltage Electrical Power Conductors and Cables
4. 26 0526 - Grounding and Bonding for Electrical Systems
5. 26 0533 - Raceways and Boxes for Electrical Systems
6. 26 0529 - Hangers and Supports for Electrical Systems
7. 26 5119 - LED Interior Lighting
8. <**List items that may be furnished by others, but installed by this contractor**>

1.3 SUMMARY

A. Section Includes:

1. The intent of this specification section is to outline the overall responsibilities of the Electronic Security Systems Integrator (ESSI); his qualifications procedures; his warranty obligations; and a high-level outline of the delineation of responsibilities on this project as it pertains to detention security.

1.4 DEFINITIONS

A. DEC: Detention Equipment Contractor

B. ESSI: Electronic Security System Integrator

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Submit certification that fabrication for completed equipment rack and control panel assemblies will withstand seismic forces defined in Section 27 0548.16 "Seismic Controls for Communications Systems." Include the following:

1. Description of features included in equipment and equipment assemblies to withstand anticipated acceleration loads.
2. Basis for Certification: Indicate whether withstand 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."

3. Dimensioned Outline Drawings of Equipment Racks and Control Panels: Identify center of gravity of fully equipped and assembled units and locate and describe mounting and anchorage provisions.
4. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Qualification Data: For Installer and ESSI.

1.6 QUALITY ASSURANCE

A. The following qualified ESSIs shall be allowed to submit pricing on this project:

1. Accurate Controls, Inc. (Ripon WI)
2. Security Automation Systems, Inc. (Indianapolis, IN)

B. Approval for ESSIs

1. Approval of an ESSI does not include acceptance or products or procedures, unless approved by the Architect/Engineer.
2. All ESSIs must adhere to the materials, intent, and design specified herein.
3. Integrator required to have Illinois Private Alarm Contractor Agency License.
4. Firms desiring to bid the Division 28 specifications as an ESSI must submit, at least 20 days prior to the bid, a pre-qualification package that includes the following information (acceptance by the A/E will be demonstrated by the submitting ESSI being added to the specification by addendum):

    a. AIA-305A Contractor Qualification Statement.
    b. Provide ESSI UL 508A certification. The ESSI must be able to apply the UL 508A listing mark at their facility.
    c. The ESSI must demonstrate that they have a minimum of 7 years' experience in the field of integrated security and communication systems serving the corrections industry under the same company name.
    d. A letter from the ESSI's surety company reflecting the surety company's history and experience with the ESSI and the current bonding limit for the last 5 years.
    e. Evidence that the principal members and key personnel (include project manager, on-site supervisor, system engineer and software engineer) to be assigned to this project have a minimum of 7 years' experience each in successfully completing detention projects of equal scope, listed manufacturers, quality, type, and complexity to that required herein. Include resumes of all personnel. Provide organizational chart of the entire organization.
    f. Company's history of providing security electronic control systems for correctional facilities.
    g. Provide a list of at least 5 other projects in within 200 miles of this project location similar in size and scope to this project (utilizing programmable logic controllers) completed in the last 5 years. For each project list the major subsystems with manufacturers used and the total dollar amount of the project. The current end-user contact (name, address, and phone number) shall be listed for each project.
    h. List the names and up-to-date phone numbers of the Architect, System Engineer and Owner of ALL Jail/Detention/Corrections projects installed by the submitting ESSI within the last 5 years.
    i. Provide a narrative description of all software to be utilized, network types, and interfaces with other systems. Any custom software that is to be developed by the ESSI shall be described in detail.
    j. An explanation of the company's ability to provide service to the Owner and the location and proximity of the company's physical service organization location.

k. A signed statement that the ESSIs provided system software and hardware will meet all division 28 specifications pertaining to the detention security systems.

5. All alternate ESSIs are prohibited from any substitutions or deviations from the specified intent, products, and levels of quality specified herein.

C. 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.

1.7 WARRANTY

A. The ESSI shall warrant all material and workmanship for a period of twelve (12) months after substantial completion. The warranty shall cover all material and software provided. The ESSI shall provide qualified and/or manufacturer-certified technicians capable of diagnosing and repairing the installed system.

B. The ESSI shall repair or replace (at no cost to the Owner) any defective materials or work when given written notice during the warranty period. Warranty service shall be provided to the Owner during normal working hours.

C. ESSI shall provide 4 service and inspection trips during the 12-month warranty period. Equipment shall be inspected for function. Necessary adjustments and programming shall be made as required, and a written account provided to the Owner and Architect. Schedule the first visit 2 months after operational turn- over. The remaining trips will be equally spaced three months apart.

D. ESSI shall provide emergency service during the 12-month warranty period, should a break down occur. Classifications of component failures and the required response time for each classification are as follows:

1. "Critical" - Items which compromise the security of the facility or have an adverse effect on the operations of the facility. Items in this category shall be returned to service within four (4) hours after receipt of a service call. Service shall be available seven (7) days per week and twenty-four (24) hours per day. The ESSI shall call the designated Owner's Representative within 2 hours of receiving the service call to inform him of the estimated arrival time of the service personnel. The following items are considered "critical":

   a. Uninterruptible Power Supply - all components.
   b. Door Control and Door Monitoring - building perimeter doors and all other monitored doors.
   c. IP Video Communication System - door control cameras, corridor cameras, all monitors and video switcher.
   d. Programmable Logic Controllers - all components or software.
   e. Control Panels and Consoles - touchscreen control systems.
   f. IP Audio Communications System - all components.
   g. Security Automation System - PLC network, LAN network, touchscreen terminals.
   h. Grounding and Surge Protection - all components.

2. "Sensitive" - Items which adversely impact the operations of the facility but are not considered "critical" as defined above. Items in this category shall be returned to service within eight (8) hours after receipt of a service call. Service shall be available seven (7) days per week and twenty-four (24) hours per day. The Security Electronics Contractor shall call the designated Owner's Representative within 2 hours of receiving the service call to inform him of the estimated arrival time of the service personnel. The following items are considered "sensitive":

a. IP Video Communication System - all other cameras not listed under "critical" above and VCR or digital recorder.
b. IP Audio Communication System - single intercom station.
c. Security Automation System - file server and printer.

3. "Normal" - Items which require maintenance support but are not "critical" or "sensitive" as defined above. These are typically items that facility personnel identify and accept that maintenance will be performed by the SEC during the next quarterly maintenance visit. The following items are considered "normal"

a. Control Panels and Consoles - all other components not listed in "critical" or "sensitive" above.
b. IP Audio Communication System - single paging station.

E. Software maintenance during the 12-month warranty period:

1. During the initial one-year warranty/guarantee period the ESSI shall provide the owner with four update/revision of schedule definitions.
a. Revise schedule of openings assigned to groups.
b. Review functions allowed at openings if no hardware or wiring changes is required.
c. Camera to monitor and group and sequence assignments.

2. Service Agreement:

a. Renewal of Maintenance Service Contract: No later than 60 days prior to the expiration of the maintenance services contract, deliver to the Owner a proposal to provide contract maintenance and repair services for an additional one-year term. Owner will be under no obligation to accept maintenance service proposal.

F. The warranty shall exclude acts of vandalism, abuse, neglect, Owner misuse, failure of the Owner to provide continuous environmental conditions for which the installed equipment is rated for, and all other acts beyond the control of the ESSI (i.e. – weather damage, floods, fire, lightning, and similar acts).

1.8 DELINEATION OF RESPONSIBILITY

A. General Contractor:

1. Include detailed scheduling information for Security Electronics systems installation and testing in the construction schedule. This shall provide the ESSI free access and total control with no other construction traffic for a period of three weeks for proper testing and certification of the system.
2. Provide coordination to ensure that control rooms and Security Electronics rooms are completed as early as possible to facilitate installation of control wiring. Control rooms and Security Electronics equipment rooms shall be free of airborne contaminants from cutting, grinding, painting, masonry work, etc., prior to the installation of any Security Electronics equipment. HVAC system must be started.
3. Provide coordination with the supplier of detention hardware and frames, millwork subcontractor, electrical subcontractor and other trades that may be affected by this work.
4. Conduct periodic coordination meetings between security, electrical, plumbing, masonry, and all other contractors to make everyone aware of critical areas of construction. Distribute the meeting minutes and attendance to the Architect/Engineer and Agency within five (5) working days.

5. Provide coordination with the ESSI to complete the inspections, submittal and closeout documentation as described in the general provisions.

B. Electrical Contractor:

1. Coordinate electrical requirements of all Security Electronics systems with General Contractor, DEC and ESSI.
2. Provide termination of all 120-volt power connections required by the Security Electronics system. Lighting, Water Solenoid and Receptacle control terminations shall be done by the electrical contractor at the terminal strip provided by the ESSI.
3. Provide to all equipment requiring 120-volt power connections, power from emergency panels, generator or UPS.
4. Furnish and install a complete conduit raceway system including back boxes, junction boxes, mortar boxes, and equipment room gutters/cable trays required by the ESSI.
5. Install all specialty back boxes including racks, cabinets, camera housings and speaker back boxes provided by the ESSI. Set all equipment racks in place and provide and install conduits from raceway to equipment racks and cabinets.
6. The raceway system provided by Division 26 shall installed to facilitate continuous cable runs, if cable runs cannot be installed without splice the electrical contractor shall modify conduit as needed.
7. Furnish and install a complete Security Electronics cable plant including power, signal, and ground wiring, per NEC, as shown in the project documents and as per ESSI specific system requirements.
8. Obtain all required permits and licenses and pay all required fees.

C. Electronic Security Systems Integrator (ESSI):

1. Furnish to Detention Equipment Contractor a complete fully functional Security Electronics system as defined by the Division 28, related specifications and as shown on the drawings. This shall also include all requirements for proper control of detention hardware as supplied by said contractor.
2. Provide field device installation and terminations of all security electronic devices including all door locks and door position switches.
3. Provide final terminations of all low voltage wiring at head end equipment racks/cabinets for all Security Electronics systems, including door lock control and monitoring wire.
4. Provide coordination of the installation and electrical requirements of the Security Electronics systems with the Electrical Contractor.
5. Provide low voltage relay panels for control of lighting, power circuits and inmate telephones.
6. Provide all required UPS units for all security equipment cabinets, racks and operator stations.
    a. Prior to fabrication, coordinate exact location and installation of Security Electronics with other trades.
7. Provide complete system test and written operational certification to the Architect/Engineer and Agency prior to substantial completion.
8. Provide Agency training by factory-trained and authorized personnel as specified.
9. Turn over to owners all termination point and interconnection schedules, all programming source codes including Touch Screen software, PLC development software, VMS viewing software, and applicable license required for operations. This is to also include the touch screen and security management systems runtime licenses.

D. Detention Equipment Contractor (DEC):

1. Subcontract the services of a qualified ESSI.
2. Coordinate with the General Contractor, Electrical Contractor and ESSI.
3. Provide all hardware and frame schedules.

4. Provide wiring diagrams specific to this project.
5. Furnish and install security hardware.
6. Provide all the necessary and proper adjustments for correct hardware operation.

E. Owners:

1. Provide and install inmate telephone system.
2. Provide and install video visitation system.
3. Provide and install video arraignment system.
4. Provide data connections to the Security Management System for remote diagnostics by the ESSI.
5. Provide a link between the owner and ESSI network for distribution of live and recorded camera video from video management system. The link shall be established through a subnet independent of either network and include a layer 3 switch at the ESSI main distribution frame to provide routing between the linking subnet and the ESSI network. The owners shall provide a firewall with NAT on the owner side of the link. Routing between the linking subnet and the owner network shall either be integrated into the firewall or at an owner provided device

PART 2 - PRODUCTS – DOES NOT APPLY

PART 3 - EXECUTION

3.1 SYSTEMS INTEGRATION

A. Integrate installations and connections of equipment and systems specified in this Section with those specified in the following Sections:

1. Section 08 7163 "Detention Door Hardware" for detention hardware controlled by detention monitoring and control system.
2. Section 275123 "Intercommunications and Program Systems" for intercommunication and paging equipment.
3. Section 28 4621.11 "Addressable Fire-Alarm Systems" and Section 284621.13 "Conventional Fire-Alarm Systems" for fire alarm equipment and devices.
4. Section 28 3121 "Area and Perimeter Intrusion Detection" for detection devices.
5. Section 28 2000 "Video Surveillance" for closed-circuit television equipment.
6. Section 32 3113 "Chain Link Fences and Gates" for gate operators and locking devices.

B. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

C. Right of Way: Give to raceways and piping systems installed at a required slope.

D. Security Fasteners: Where accessible to inmates, install detention monitoring and control components using security fasteners with head style appropriate for fabrication requirements, strength, and finish of adjacent materials, except that a maximum of two different sets of tools shall be required to operate security fasteners for Project. Provide stainless steel security fasteners in stainless steel materials.

3.2 GROUNDING

A. AC Power and Lighting Circuits: Comply with Section 260526 "Grounding and Bonding for Electrical Systems" for materials and installation requirements.

B. Class 2 Power - Limited Power, Signal, and Control Circuits: Ground systems and equipment according to manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. ESSI shall perform the following tests and inspections:

1. Schedule visual and mechanical inspections and electrical tests with at least seven days' advance notice.
2. Inspect detention monitoring and control components for defects and physical damage, labeling of testing laboratory, and nameplate compliance with the Contract Documents.
3. Inspect interiors of enclosures, including the following:

    a. Integrity of mechanical and electrical connections.
    b. Component type and labeling verification.
    c. Ratings of installed components.

4. Electrical Tests: Use caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:

    a. Continuity tests of circuits.
    b. Operational Tests: Set and operate controls at each control panel and at each monitored and controlled device to demonstrate their functions and capabilities. Use a methodical sequence that cues and reproduces actual operating functions as recommended by manufacturer. Record response to each test command and operation, including logging and printout of events. Record time intervals between initiation of alarm conditions and registration of alarms at control (panel), and between initiation of commands and execution at controlled equipment.

        1) Coordinate testing required by this Section with that required by Sections specifying equipment being monitored and controlled and systems to be integrated with detention monitoring and control work.
        2) Simulate malfunctions to verify protective features and appropriate alarm indications.

5. Seismic-restraint tests and inspections shall include the following:

    a. Type, size, quantity, arrangement, and proper installation of mounting or anchorage devices.
    b. Test mounting and anchorage devices according to requirements in Section 27 0548.16 "Seismic Controls for Communications Systems."

6. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.
7. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.
8. Record of Tests and Inspections: Maintain and submit documentation of tests and inspections, including references to manufacturers' written instructions and other test and

inspection criteria. Include results of tests, retests, and inspections. Include printout of testing event log, annotated to provide a machine record of testing that corresponds to written test records.

B. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Demonstration:

1. Prior to owner acceptance the ESSI shall demonstrate the functionality of the entire system to the A/E, and Owner's representative.

    a. Provide the A/E with a detailed test report showing results of performance tests done on every device that makes up the security and function in the system.
    b. Perform such tests as the A/E may require satisfying them as to the accuracy of the submitted test report. More than two discrepancies between the observed performance and the reported performance shall be grounds for rejection of the entire test report and requiring the contractor to repeat this entire final test procedure. If a second test and demonstration is required, A/E expenses shall be the responsibility of the ESSI.

2. Conduct a complete visual inspection of all appearance items and of workmanship in the presence of the A/E and Owner's representative.

B. Training:

1. Provide complete operator training for the Owner's personnel.

    a. Provide three (8) eight-hour sessions on consecutive days at times set by the owner. These should be scheduled as part of the owner's pre-occupancy transition training.

2. Provide a video training session, which can be used by the Owner for training new employees. This tape shall be carefully organized and segmented so that training may be given on the complete system or on specific functions as may be appropriate.

C. Shake Down Period:

1. The ESSI shall provide 5 days of system shakedown, which shall include providing a fully trained employee of the ESSI who shall provide additional training, system repairs and alterations prior to, during and after the transfer of inmates into the facility. The system shall be fully operational and certified prior to the shakedown period beginning.
2. This person shall be onsite during the 1st shift and be available or on-call during 2nd and 3rd shift.

END OF SECTION

SECTION 28 0553

IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the security drawings:

1) Color and legend requirements for labels and signs.
2) Labels.
3) Signs.
4) Fasteners for labels and signs.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the security drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the security drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. 28 2000 – Video Surveillance
2. 28 5200 – Security Intercommunication System
3. 28 5211 - Detention Monitoring and Control Systems Hardware
4. 28 5213 - Detention Monitoring and Control Systems Software
5. 28 5215 - Auxiliary Systems Control
6. <**List sections that require direct coordination with this section**>

B. Installed but furnished by others:

1. Related Divisions 08 Sections:

a. Prepare doors and frames for electrified hardware and devices specified in this section
b. Coordinate templates and preparation of doors and frames for electrified hardware.
c. Coordinate hardware with the requirements of this section.

2. Related Division 11 Sections:

a. Coordinate templates and preparation of doors and frames for electrified hardware.
b. Coordinate power requirements for electric hardware with the requirements of this section.
c. Prepare doors and frames for electrified hardware and devices specified in this section.

3. 26 0519 - Low-Voltage Electrical Power Conductors and Cables
4. 26 0526 - Grounding and Bonding for Electrical Systems
5. 26 0533 - Raceways and Boxes for Electrical Systems
6. 26 0529 - Hangers and Supports for Electrical Systems
7. 26 5119 - LED Interior Lighting
8. <**List items that may be furnished by others, but installed by this contractor**>

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 communications identification products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70 and TIA 606-B.

B. Comply with ANSI Z535.4 for safety signs and labels.

C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Equipment Identification Labels:

1. Black letters on a white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Brady Corporation.
    b. Champion America.
    c. LEM Products Inc.
    d. Panduit Corp.

2.4 SIGNS

A. Laminated-Acrylic or Melamine-Plastic Signs:

1. Engraved legend.
2. Thickness:

    a. For signs up to 20 sq. in., minimum 1/16 inch thick.
    b. For signs larger than 20 sq. in., 1/8 inch thick.
    c. Engraved legend with black letters on white face.
    d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.
    e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.

G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

H. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
3. Provide label 6 inches from cable end.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.

C. Faceplates: Label individual jacks within each faceplates with self-adhesive labels. Each faceplate shall be labeled with circuit as shown on plan.

D. Equipment Room Labeling:

1. Racks, Frames, and Enclosures: Identify front and rear of each with screw-on, engraved sign containing equipment designation.
2. Patch Panels: Label individual rows and outlets, starting at to left and working down, with self-adhesive labels.

E. Backbone Cables: Label each cable with a vinyl-wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.

F. Horizontal Cables: Label each cable with a vinyl-wraparound labeling circuit.

G. Equipment Identification Labels:

1. Indoor Equipment: Laminated-acrylic or melamine-plastic sign.
2. Equipment to Be Labeled:

a. Security cabinets and racks.

END OF SECTION

SECTION 28 1116

SECURITY RACKS, FRAMES, AND ENCLOSURES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the security drawings:

1) 19-inch equipment racks.
2) 19-inch freestanding and wall-mounted equipment cabinets.
3) Grounding.
4) Labeling.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the security drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the security drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. 28 0500 – Common Work Results for Detention Security
2. 28 2000 – Video Surveillance
3. 28 5200 – Security Intercommunication System
4. 28 5211 – Detention Monitoring and Control Systems Hardware
5. 28 5213 – Detention Monitoring and Control Systems Software
6. 28 5215 – Auxiliary Systems Control
7. <**List sections that require direct coordination with this section**>

B. Installed but furnished by others:

1. Related Divisions 08 Sections:

    a. Prepare doors and frames for electrified hardware and devices specified in this section
    b. Coordinate templates and preparation of doors and frames for electrified hardware.
    c. Coordinate hardware with the requirements of this section.

2. Related Division 11 Sections:

    a. Coordinate templates and preparation of doors and frames for electrified hardware.
    b. Coordinate power requirements for electric hardware with the requirements of this section.
    c. Prepare doors and frames for electrified hardware and devices specified in this section.

3. 26 0519 - Low-Voltage Electrical Power Conductors and Cables
4. 26 0526 - Grounding and Bonding for Electrical Systems
5. 26 0533 - Raceways and Boxes for Electrical Systems
6. 26 0529 - Hangers and Supports for Electrical Systems
7. 26 5119 - LED Interior Lighting
8. <**List items that may be furnished by others, but installed by this contractor**>

1.3 DEFINITIONS

A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.

B. BICSI: Building Industry Consulting Service International.

C. LAN: Local area network.

D. RCDD: Registered communications distribution designer.

E. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.

F. SEC: Security Equipment Cabinet.

G. TGB: Telecommunications grounding bus bar.

H. TMGB: Telecommunications main grounding bus bar.

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 equipment racks and cabinets.
2. Include rated capacities, operating characteristics, electrical characteristics, certifications, standards compliance, and furnished specialties and accessories.

B. Shop Drawings: For communications racks, frames, and enclosures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of TGB and its mounting detail showing standoff insulators and wall-mounting brackets.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

A. A single installer shall be responsible for the procurement and installation of all wiring, cabling and accessories that make up the designed I.T. network described in these construction documents. This includes, but is not limited to: network racks, patch panels, rack-mounted power supplies, faber optic cabling, and copper horizontal cabling.

1. Separate contractors, sub-contractors, vendors, etc. shall not be permitted to install network wiring for their own IP-based systems, for example. This wiring shall only be permitted to be installed by the project's primary division 27 wiring installer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Equipment shall withstand the effects of earthquake motions determined according to [**ASCE/SEI 7**] [**Telcordia GR-63-CORE requirements for Zone 4 Seismic Earthquake Environments**] <**Insert requirement**>.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified[**and the unit will be fully operational after the seismic event**]."

B. UL listed.

C. RoHS compliant.

D. Compliant with requirements of the Payment Card Industry Data Security Standard.

2.2 19-INCH EQUIPMENT CABINETS

A. Description: Manufacturer-assembled four-post frame enclosed by side and top panels and front and rear doors, designed for mounting telecommunications equipment. Width is compatible with EIA/ECIA 310-E, 19-inch equipment mounting with an opening of 17.72 inches between rails.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden Inc.
2. CommScope, Inc.
3. Hubbell Premise Wiring.
4. Legrand NA (Middle Atlantic Products Division).
5. Panduit Corp.

C. General Cabinet Requirements:

1. Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
2. Material: Steel.
3. Finish: Manufacturer's standard, baked-polyester powder coat.
4. Color: Black.

D. Modular Freestanding Cabinets:

1. Overall Depth: 29 inches.
2. Load Rating: 3000 lb.
3. Number of Rack Units: 45.
    a. Numbering: Every five rack units, on interior of rack.
4. Threads: 12-24.
5. Removable and lockable side and top panels.
6. Bi-folding, hinged and lockable front and rear doors. Large Single Doors not allowed.
7. Adjustable feet for leveling.
8. Screened ventilation openings in roof and rear door.
9. Cable access provisions in roof and base.
10. Ground Bar.
11. Roof-mounted, 550-cfm fan with filter.
12. All cabinets keyed alike.

E. Modular Wall Cabinets:

1. Depth: 29 inches.
2. Load Rating: 200 lb.
3. Number of Rack Units: 18.
4. Threads: 12-24.
5. Lockable front doors.
6. Louvered side panels.
7. Cable access provisions top and bottom.
8. Grounding lug.
9. Roof-mounted, 250-cfm fan.
10. All cabinets keyed alike.

F. Cable Management:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.
4. Provide horizontal crossover cable manager at top of each relay rack, with a minimum height of two rack units each.

2.3 NEMA-RATED SECURITY EQUIPMENT CABINETS (SEC)

A. Description: NEMA-Rated, wall-mounted enclosures with hinged doors for enclosing detention security system components.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hoffman
2. Hammond Manufacturing
3. Saginaw Control and Engineering

C. Construction:

1. All equipment enclosures installed indoors shall be NEMA 12 enclosures.
2. Provide double door, continuous hinge enclosures
3. Enclosures shall be constructed of 14 gauge rolled steel, minimum.
4. 60" x 48" and larger enclosures will be equipped with floor standing "feet".
5. Enclosures finish shall be ANSI 61 gray inside and out.

D. Features and Accessories:

1. Enclosure doors shall be furnished with key lock-able doors with all Enclosures under Division 28 keyed alike.
2. All enclosures shall be furnished with removable steel back panels for mounting equipment.
3. All enclosures shall be furnished with black-on-white laminated plastic nameplates identifying each cabinet.
4. Enclosure back panels shall be furnished with a grounding lug to be used to connect the cabinet to security/technology grounding backbone.
5. Enclosures shall be furnished with cross-ventilated, forced-air cooling to maintain the optimum temperature performance range of the equipment.

2.4 POWER DISTRIBUTION UNITS – RACK MOUNTED

A. MANUFACTURERS

1. Eaton
2. Schneider Electric
3. Legrand

B. Features:

1. Color-coded outlet sections
2. Rack mountable

C. Orientation: Vertical

D. Input

1. Voltage: [**120V, Single-Phase**] [**208V, Single-Phase**]
2. Plug: **[NEMA 5-15P] [NEMA 5-20P] [NEMA L6-30P]**

E. Outputs

1. Voltage: [**120V, Single-Phase]**
2. Plugs: 24 5-20R
3. Current Rating: 24A

2.5 LABELING

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

C. Coordinate location of power raceways and receptacles with locations of security equipment requiring electrical power to operate.

D. The System shall be installed by qualified personnel in strict compliance with manufacturer's instructions.

E. All equipment cabinets are to be assembled and tested in the ESSI's facility prior to on-site installation. With the exception of field wiring, all interconnecting cables should be terminated and installed.

F. Wiring shall be color coded, uniform and in accordance with national electric codes and manufacturer's instructions.

G. Equipment shall be firmly secured, plumb and level.

H. Freestanding cabinets shall be installed with the minimum NEC clearance of three feet in the front and three feet in the rear of the cabinet.

I. All cable shall be tagged and identified.

J. Provide appropriate cable management system. Segregate cabling into groups based on signal type and voltage.

K. Maintain separation between 120VAC power cables and all signal level cables. When necessary, cross 120vac power cables perpendicular to all other cable types.

L. Grounding of audio cables and peripheral equipment shall be installed per manufacturer's direction to eliminate noise induction and achieve optimum system performance.

M. All entrance and exit conduit shall utilize grounding bushings to terminate the conduit to the equipment enclosure. Route a green insulated ground conductor to the TMGB/TGB.

N. Blank panels and vent panels shall be used to fill all unused rack space.

O. Every equipment rack shall be equipped with a ventilation fan and adequate venting. The fan shall be installed to bring air in from the bottom of the rack, drawing the cool air up and exiting out the top. Provide security covers for all rack mounted electronic components that do not require user interface.

P. Upon completion of the work, remove excess debris, materials, equipment, apparatus, tools etc. and leave the premises clean, neat and orderly.

Q. Substitutions of equal quality will be accepted. All substitutions are to be approved prior to bid and listed by addenda. Substitutions will not be accepted after the schedule bid time.

R. Provide materials listed by UL or ETL.

3.2 GROUNDING

A. Comply with NECA/BICSI 607.

B. Install grounding according to BICSI ITSIMM, "Bonding, Grounding (Earthing) and Electrical Protection" Ch.

END OF SECTION

SECTION 28 2000

VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the security drawings:

1) Electrical equipment coordination and installation.
2) Common electrical installation requirements.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the security drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the security drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. 28 0500 – Common Work Results for Detention Security
2. 28 1116 – Security Racks, Frames, And Enclosures
3. 28 2000 – Video Surveillance
4. 28 5200 – Security Intercommunication System
5. 28 5211 – Detention Monitoring and Control Systems Hardware
6. 28 5213 – Detention Monitoring and Control Systems Software
7. 28 5215 – Auxiliary Systems Control
8. <**List sections that require direct coordination with this section**>

B. Installed but furnished by others:

1. Related Divisions 08 Sections:

a. Prepare doors and frames for electrified hardware and devices specified in this section
b. Coordinate templates and preparation of doors and frames for electrified hardware.
c. Coordinate hardware with the requirements of this section.

2. Related Division 11 Sections:

a. Coordinate templates and preparation of doors and frames for electrified hardware.
b. Coordinate power requirements for electric hardware with the requirements of this section.
c. Prepare doors and frames for electrified hardware and devices specified in this section.

3. 26 0519 - Low-Voltage Electrical Power Conductors and Cables
4. 26 0526 - Grounding and Bonding for Electrical Systems
5. 26 0533 - Raceways and Boxes for Electrical Systems
6. 26 0529 - Hangers and Supports for Electrical Systems
7. 26 5119 - LED Interior Lighting
8. <**List items that may be furnished by others, but installed by this contractor**>

1.3 SUMMARY

A. Description:

1. Provide a fully functional IP-based video surveillance system integrated with the electronic security system. The system shall consist of color cameras, lenses, monitors, mounting hardware, housings, processing equipment, digital video recorders and amplifiers.
2. The system shall permit visual monitoring and surveillance of selected areas automatically based on events via the PLC for intercom, door alarm and duress alarm.
3. The system shall provide for the visual surveillance of all camera locations from the VGUI operator stations, jail administrators office, the sheriff's office, and any other designated location on the Owner's network. The DVR shall be tied to the Owner's network such that any computer within the system with appropriate passwords and permissions can call-up live and recorded video from the law enforcement facility.
4. Selected exterior cameras will use motion detection that triggers an alarm and a spot monitor view within areas of view programmatically proscribed by the system via analytics, and interior cell cameras will have views limited to selected areas within the cell. In these and all cases, the ESSI will meet with the Owner and the Architect/Engineer to exactly determine camera view and alert requirements.
5. The contractor shall provide initial configuration of the camera views for the video client software for each GUI control station location, with input from the Owner.
6. All cameras in the video management system shall be licensed as required for proper viewing and recording.

B. Section Includes:

1. ?

1.4 DEFINITIONS

A. AGC: Automatic gain control.

B. BNC: Bayonet Neill-Concelman - type of connector.

C. B/W: Black and white.

D. CCD: Charge-coupled device.

E. FTP: File transfer protocol.

F. IP: Internet protocol.

G. LAN: Local area network.

H. MPEG: Moving picture experts group.

I. NTSC: National Television System Committee.

J. PC: Personal computer.

K. PTZ: Pan-tilt-zoom.

L. RAID: Redundant array of independent disks.

M. TCP: Transmission control protocol - connects hosts on the Internet.

N. UPS: Uninterruptible power supply.

O. WAN: Wide area network.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For video surveillance. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
4. UPS: Sizing calculations.
5. Wiring Diagrams: For power, signal, and control wiring.

C. Design Data: Include an equipment list consisting of every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.

1.6 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for cameras, camera-supporting equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
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.

B. Field quality-control reports.

C. Product Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 7823 "Operation and Maintenance Data," include the following:

1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient temperatures of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.
2. Interior, Controlled Environment: System components, except central-station control unit, installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
3. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph. Use NEMA 250, Type 3R enclosures.
4. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion for cameras.

2. Warranty Period: One year from date of Substantial Completion for software.

PART 2 - PRODUCTS

2.1 GENERAL SYSTEM REQUIREMENTS

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits" as recommended by manufacturer for type of line being protected.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Video surveillance system shall withstand the effects of earthquake motions determined according to [**ASCE/SEI 7**] <**Insert requirement**>.

1. 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**]."

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.

C. Comply with NECA 1.

D. Comply with NFPA 70.

E. Electronic data exchange between video surveillance system with an access-control system shall comply with SIA TVAC.

2.3 CAMERAS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Axis Communications.
2. Bosch Security Systems, Inc.
3. Sony.
4. Hanwa

B. Cameras shall be provided as specified on drawings.

2.4 COMPUTERS FOR VIDEO CLIENT WORKSTATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dell
2. HP
3. Hanwha
4. Pelco

B. Description: Contractor shall provide video client workstations at master control and at each housing control location. See drawings for exact locations. Workstation shall be loaded with the specified video management software.

C. Video Client Workstations:

1. The Video Client Workstations shall include the following (minimum) features:

a. Processor: Intel® Core™ i7-9700, 3.0Ghz to 4.7Ghz (8 Cores, 8 Threads, 12MB)
b. Operating System: Windows 10 Professional, 64-bit
c. Memory: 16GB 2x8GB DDR4 2666MHz UDIMM Non-ECC
d. Hard Drive: 2.5” 256GB SATA Class 20 Solid State Drive
e. Video Card (4K): NVIDIA Quadro P620
f. Optical Drive: 8x DVD+/-RW 9.5mm Optical Disk Drive
g. Keyboard: Dell USB Keyboard, English, Black
h. Mouse: Dell USB Optical Mouse with Scroll, Black
i. Anti-Virus software: Owner shall provide/install anti-virus software

2.5 MONITOR FOR VIDEO CLIENT WORKSTATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bosch.
2. HP.
3. LG
4. Samsung

B. Description: High performance HD LCD monitor. Full HD 1080p resolution (1920 x 1080), feature a 3-D comb filter, have performance-enhancing features such as picture-in-picture, picture-and-picture, menu controls to adjust video features, and automatic detection of a PAL or an NTSC signal, and display images using an aspect ratio of 16:9 and be capable of displaying 16.7 million colors.

1. Electrical/Mechanical

a. Main Supply Input Voltage: 100-230 VAC, 50/60 Hz
b. Monitor Input Voltage/Power Requirements: 90-264 VAC, 50/60
c. Power at Rated Voltage: Operation: 260 W
d. Standby: 10 W
e. The HD monitor shall conform to the 130 x 130 mm VESA Mounting standard.

2. Video:

a. Sync Format: PAL/NTSC

b. LCD Panel: Active Matrix TFT LCD
c. Viewable Picture Area: 27 in, measured diagonally
d. Pixel Pitch (H x V): 0.4845 x 0.4845 mm
e. Resolution: 1920 x 1080 pixels
f. Aspect Ratio: 16:9
g. Display Colors: 16.7 million colors
h. Response Time: 12 milliseconds
i. Backlight:

1) Twenty (20) cold cathode fluorescent tubes
2) Rated Life: 30,000 hours

3. Optical Characteristics

a. Luminance: 350 cd/m2, anti-glare, hard-coating (3H) treatment
b. Contrast Ratio: 3000:1 (typical)
c. Viewing Angle:
1) Horizontal: 178°
2) Vertical: 178°

4. Connectors

a. Audio:

1) Four (4) RCA type (2 stereo inputs)
2) One (1) PC stereo input
3) One (1) looping output, 1/8 in. mini phono plug

b. Digital:

1) One (1) DisplayPort
2) One (1) DVI-D
3) One (1) HDMI
4) One (1) VGA

c. Power Cord: Two 3-wire with a grounded plug, 1.8 m (6 ft) long.

5. Basis of Design Model: Bosch UML-274-90 with appropriate mount – provide two at each housing pod control location.
6. Basis of Design Model: Bosch UML-553-90 with appropriate mount – provide four at Master Control.

2.6 CAMERA-SUPPORTING EQUIPMENT

A. Wall Mount Brackets: Aluminum surface mounted bracket, white powder coated finish, IK10 vandal resistant.

B. Pole Mount Brackets: Aluminum pole mount bracket, white powder coated finish, IK10 vandal resistant, marine grade steel straps.

C. Corner Mount Brackets: Aluminum corner mount bracket, white powder coated finish, IK10 vandal resistant.

D. Recessed Ceiling Mount: White plastic camera holder for easy installation into lay-in ceiling tile.

E. Pendant Mount: Aluminum pipe pendant, white powder coated finish.

2.7 VIDEO MANAGEMENT SOFTWARE

A. Manufacturers

1. exaqVision
2. Milestone Systems

B. Video Management System ("VMS")

1. The NVR shall come pre-loaded with VMS server software.
2. The VMS server software shall provide the following features as a minimum:

a. System

1) One server connection per client
2) Browser-based viewing of live and stored video
3) Auto detection of supported cameras
4) Support for fish-eye and panoramic lens cameras
5) Client bandwidth throttling
6) Soft triggers
7) Pre and post alarm recording
8) Continuous motion, time or alarm-based recording, configurable per camera

b. Live video view
1) Multiple monitor view support
2) PTZ control and presets
3) Digital PTZ control and presets
4) Motion and alarm indication
5) Event linking on discrete inputs

c. Search, playback, export, archive

1) Instant replay
2) Event search

a) Thumbnail views
b) Timeline views

3) Multi-camera playback
4) Export options

a) USB storage device
b) AVI, .MOV, .MP4 or.EXE file

d. The NVR shall have the ability to support pre-loaded VMS software providing additional advanced functionality, including the following:

1) System

a) Server connections – up to 512 via a thick client interface or 16 via web client
b) Ability to specify minimum and maximum retention times on a per camera basis

c) Time-lapse recording
d) Extended storage
e) Archiving
f) Audit trail
g) Custom user groups
h) Intelligent search
i) E-mail notifications on system health
j) Enterprise level camera, server, and user management
k) LDAP and active directory support

2) Live view

a) Event linking on video, serial, and health events
b) Video wall support
c) Event-driven and time-based video switching
d) Camera groups
e) Multi-streaming
f) Event notifications
g) Map support, including hierarchical maps
h) Two-way audio

3) Search, playback, export, archive

a) Multiple camera export

2.8 NETWORK VIDEO RECORDERS

A. Manufacturers

1. exaqVision
2. Milestone Systems

B. The Hybrid Network Video Recorder ("NVR") shall be an appliance to acquire, record, store, and display video signals from both directly connected analog cameras and IP network video cameras and encoders.

C. The NVR appliance hardware shall have the following characteristics:

1. Camera inputs

a. Up to 128 IP video cameras or encoders

2. RAID configuration: _____ TB RAID 6
3. Video compression: MJPEG, MPEG-4, H.264, H.265
4. Alarms:

a. Inputs: Provision for 8 external TTL
b. Outputs: Provision for 3 external TTL, 1 external relay

5. Server characteristics:

a. Operating system: Windows 10, Windows 2012 R2, or Ubuntu Linux 16.04
b. Operating system drive: 120 GB SSD – Windows / 60 GB SSD – Linux
c. Monitor outputs: 1 HDMI + 1 DVI-I + 1 VGA (max 2 simultaneously)
d. Processor: Gen 7 Intel® Core i7 or Gen 7 Intel® Xeon E3

e. Memory: 16GB
f. Network: 2 x 1000 BASE-T
g. USB 3.0 ports: 6 (2 Front, 4 Rear)

6. Enclosure

a. Material: Painted steel
b. Dimensions: 27 in. x 17 in. x 7 in.
c. Weight: 49 – 90 lbs. maximum

7. Electrical

a. Input voltage: 120/240 VAC auto-sensing
b. Power Supply: Dual Hot Swap

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.

B. Examine roughing-in for LAN, WAN, and IP network before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WIRING

A. Wiring Method:

1. Free-air cable installation:

a. Free-air installation shall be permitted in spaces with lay-in ceilings, and in non-finished spaces without ceilings (exposed structure).
b. Suspend cable not in a wireway or pathway a minimum of 8 inches above ceiling by cable supports not more than 60 inches apart.
c. Cable shall not be routed through structural members or be in contact with pipes, ducts, or other potentially damaging items.

2. Non-free-air cable installation:

a. Non-free-air installation shall be required in finished, occupied spaces without ceilings (exposed structure).
b. Cables required to be installed in conduit or cable tray. No visible, free-air installations shall be acceptable.
c. Cables installed above gypsum board ceilings (or other “hard”, non-accessible ceilings), are required to be installed in conduit stubbed, on both ends, to an accessible location.

3. Install plenum cable in environmental air spaces, including plenum ceilings.

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

C. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical 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-486B.

D. For communication wiring, comply with the following:
   1. Section 27 1513 "Communications Copper Horizontal Cabling."

E. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.3 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras and infrared illuminators level and plumb.

B. Install cameras with 84-inch-minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

C. Set pan unit and pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms, and adjust.

D. Install power supplies and other auxiliary components at control stations unless otherwise indicated.

E. Install tamper switches on components indicated to receive tamper switches, arranged to detect unauthorized entry into system-component enclosures and mounted in self-protected, inconspicuous positions.

F. Avoid ground loops by making ground connections only at the control station.

   1. For 12- and 24-V dc cameras, connect the coaxial cable shields only at the monitor end.

G. Identify system components, wiring, cabling, and terminals according to Section 27 0553 "Identification for Communications Systems."

H. All VMS head-end equipment to be contained within equipment racks.

I. Provide adequate ventilation for all heat radiating equipment. SSI shall provide fan kits as required to maintain rated operating temperature of installed equipment.

J. All system equipment and field devices to be held securely in place. Fastenings and supports shall be selected to provide a safety factor of three.

K. All system equipment equipped with plug in power connectors to be connected to a dedicated receptacle. Do not use tap connectors for plugging in multiple plugs into a single receptacle.

L. All cable within equipment racks, and cabinets, or on backboards, to be neatly bundled and secured.

M. Wires shall not be nicked, have strands removed, or have frayed strands when removing insulation or terminating.

N. Seal-tite flexible conduits, NEMA-rated weatherproof junction boxes connectors shall be utilized for exterior camera locations.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:

    a. Prepare equipment list described in "Informational Submittals" Article.
    b. Verify operation of auto-iris lenses.
    c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
    d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
    e. Set and name all preset positions; consult Owner's personnel.
    f. Set sensitivity of motion detection.
    g. Connect and verify responses to alarms.
    h. Verify operation of control-station equipment.

3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

C. Video surveillance system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to

two visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

1. Check cable connections.
2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
3. Adjust all preset positions; consult Owner's personnel.
4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's use of video surveillance system.
5. Provide a written report of adjustments and recommendations.

3.6 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

END OF SECTION

SECTION 28 4621.11

ADDRESSABLE FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the electrical drawings:

1) Fire-alarm control unit.
2) Manual fire-alarm boxes.
3) System smoke detectors.
4) Heat detectors.
5) Notification appliances.
6) Device guards.
7) Firefighters' smoke-control station.
8) Remote annunciator.
9) Addressable interface device.
10) Digital alarm communicator transmitter.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the electrical drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the electrical drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. Section 27 1513 – Communications Copper Horizontal Cabling for cables and conductors for fire-alarm systems.

1.3 DEFINITIONS

A. EMT: Electrical Metallic Tubing.

B. FACP: Fire Alarm Control Panel.

C. HLI: High Level Interface.

D. NICET: National Institute for Certification in Engineering Technologies.

E. PC: Personal computer.

F. VESDA: Very Early Smoke-Detection Apparatus.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including furnished options and accessories.

1. Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Include rated capacities, operating characteristics, and electrical characteristics.

B. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery-size calculations.
7. Include input/output matrix.
8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector.
10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Provide program report showing that air-sampling detector pipe layout balances pneumatically within the airflow range of the air-sampling detector.
12. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.

    a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
    b. Show field wiring required for HVAC unit shutdown on alarm.
    c. Locate detectors according to manufacturer's written recommendations.

13. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.
14. The system manufacturer shall furnish to the Electrical Contractor a complete wiring diagram of the system for use during construction.

15. Shop drawings for all components and a system wiring diagram showing devices and connections for this building installation shall be submitted for review. Wiring diagrams shall show location of all devices on floor plans and addressable codes adjacent to each device.

C. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire-alarm system design.
b. NICET-certified, fire-alarm technician; Level IV minimum.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Data: Certificates, for fire-alarm control unit, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
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.

C. Field quality-control reports.

1.6 SAMPLE WARRANTY: FOR SPECIAL WARRANTY.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
d. Riser diagram.
e. Device addresses.
f. Record copy of site-specific software.

g. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

1) Equipment tested.
2) Frequency of testing of installed components.
3) Frequency of inspection of installed components.
4) Requirements and recommendations related to results of maintenance.
5) Manufacturer's user training manuals.

h. Manufacturer's required maintenance related to system warranty requirements.
i. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

1.8 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. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
3. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
4. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
5. Keys and Tools: One extra set for access to locked or tamperproofed components.
6. Audible and Visual Notification Appliances: One of each type installed.
7. Fuses: Two of each type installed in the system. Provide in a box or cabinet with compartments marked with fuse types and sizes.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.

1.10 PROJECT CONDITIONS

A. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as designed.

B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:

1. Notify Architect or Owner no fewer than seven days in advance of proposed interruption of fire-alarm service.
2. Do not proceed with interruption of fire-alarm service without Architect's or Owner's written permission.

C. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

D. All new equipment, devices and components shall be compatible with existing equipment for proper operation and identical operation with the existing system. Operation of existing system shall not be altered or effected by the addition of new equipment and devices.

1.11 SEQUENCING AND SCHEDULING

A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service, and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.

B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.12 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.

1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Johnson Controls

C. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn / strobe evacuation.

D. All components provided shall be listed for use with the selected system.

E. 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.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices[**and systems**]:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Carbon monoxide detectors.
6. Automatic sprinkler system water flow.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm and specific initiating device at fire-alarm control unit.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
5. Activate smoke-control system (smoke management) at firefighters' smoke-control system panel.
6. Close smoke dampers in air ducts of designated air-conditioning duct systems.
7. Record events in the system memory.
8. Record events by the system printer.
9. Indicate device in alarm on the graphic annunciator.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Supervisory Signal Actions:

1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit.
3. Record the event on system printer.
4. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.
5. Display system status on graphic annunciator.

2.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. 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."

2.4 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.

    a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
    b. Include a real-time clock for time annotation of events on the event recorder and printer.
    c. Provide communication between the FACP and remote circuit interface panels, annunciators, and displays.
    d. The FACP shall be listed for connection to a central-station signaling system service.
    e. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.

2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, three line(s) of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

C. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

1. Pathway Class Designations: NFPA 72, Class B.
2. Pathway Survivability: Level 1.
3. Install no more than 80 percent of total circuit capacity of addressable devices on each signaling-line circuit.
4. Serial Interfaces:

    a. One dedicated RS 485 port for remote station operation using point ID DACT.
    b. One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
    c. One USB port for PC configuration.

D. Notification-Appliance Circuit:

1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

E. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

F. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

G. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed, valve-regulated, recombinant lead acid.

2.5 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.
3. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.

2.6 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be two-wire type.
3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.
7. Remote Indicator and Test Station: LED status indicator and key switch to initiate alarm for testing.

2.7 CARBON MONOXIDE DETECTORS

A. General: Carbon monoxide detector listed for connection to fire-alarm system.

1. Mounting: Adapter plate for outlet box mounting.
2. Testable by introducing test carbon monoxide into the sensing cell.
3. Detector shall provide alarm contacts and trouble contacts.
4. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
5. Comply with UL 2075.
6. Locate, mount, and wire according to manufacturer's written instructions.
7. Provide means for addressable connection to fire-alarm system.
8. Test button simulates an alarm condition.

2.8 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

1. Temperature sensors shall test for and communicate the sensitivity range of the device.

B. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.9 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.

C. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch-high letters on the lens.

1. Rated Light Output:

a. 15/30/75/110 cd, selectable in the field.

2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, red.

D. Exterior Fire Alarm Horn and Visible Notification Appliance.

1. Combination unit.
2. Weatherproof, outdoor rated.
3. Wall-mounted, unless otherwise indicated.
4. Horn Output: 90 dBA, measured 10 feet from horn.
5. Light Output: 110 cd.

2.10 FIREFIGHTERS' SMOKE-CONTROL SYSTEM

A. Initiate Smoke-Management Sequence of Operation:

1. Comply with sequence of operation as described in Section 230993.11 "Sequence of Operations for HVAC DDC." Firefighters' smoke control (FSCS) panel is specified in Division 23 and shall be furnished and installed by that Contractor.
2. Fire-alarm system shall provide all control points required to properly activate smoke-management systems.
3. First fire-alarm system initiating device to go into alarm condition shall activate the smoke-control functions.
4. Subsequent devices going into alarm condition shall have no effect on the smoke-control mode.

B. Addressable Relay Modules:

1. Provide address-setting means on the module. Store an internal identifying code for control panel use to identify the module type.
2. Allow the control panel to switch the relay contacts on command.
3. Have a minimum of two normally open and two normally closed contacts available for field wiring.
4. Listed for controlling HVAC fan motor controllers.

2.11 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Surface cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.12 ADDRESSABLE INTERFACE DEVICE

A. General:

1. Include address-setting means on the module.
2. Store an internal identifying code for control panel use to identify the module type.
3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal.

1. Allow the control panel to switch the relay contacts on command.
2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:

1. Operate notification devices.
2. Operate solenoids for use in sprinkler service.

2.13 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by device manufacturer.
2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before all other trades have completed cleanup shall be replaced.
2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.

B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.

1. Connect new equipment to existing control panel in existing part of the building.
2. Connect new equipment to existing monitoring equipment at the supervising station.
3. Expand, modify, and supplement existing [**control**] [**monitoring**] equipment as necessary to extend existing [**control**] [**monitoring**] functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.

C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.

1. Comply with requirements for seismic-restraint devices specified in Section 270548.16 "Seismic Controls for Communications Systems."

D. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.
2. Mount manual fire-alarm box on a background of a contrasting color.
3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.

E. Smoke Detectors:

1. Coordinate locations of ceiling mounted smoke detectors with lights, sprinklers, HVAC grilles and diffusers and all other ceiling mounted devices and appliances.
2. Locate all smoke detectors so that there is a minimum of 36" between the smoke detector and nearest HVAC air distribution or return device.
3. Coordinate locations of smoke detectors in elevator shafts, pits and machine rooms with sprinkler locations. Locate smoke detector within 24" of each sprinkler head.

F. Smoke- or Heat-Detector Spacing:

1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed [**30 feet**] <**Insert distance**>.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex A [**or Annex B**]in NFPA 72.
5. HVAC: Locate detectors not closer than 36 inches from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.

G. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

H. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches long shall be supported at both ends.

1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.
2. Specific care should be taken in the location of duct-type sampling tubes and associated housing to allow for proper operation, testing and inspection. Where ductwork is visible, such as mechanical rooms, the detector shall be located in ductwork to allow the alarm indicating LED to be viewed from a common passage in room. Where detector cannot be located in ductwork to be viewed from a common passage, a remote alarm indicator LED, test and reset assembly shall be provided on wall near detector for ease of locating detector in alarm condition. Actual location shall be confirmed by manufacturer as to duct width, filters, air velocities and bends in ductwork.
3. Duct detectors shall be mounted and checked prior to the start of any wiring. Checking for proper operation shall be done by the equipment supplier with a pressure differential meter. The differential pressure readings shall be between 0.04 and 1.30" of water as indicated on the differential pressure meter. If acceptable differential pressure readings are not obtained, the inlet sampling tube shall be replaced or modified by the equipment supplier until proper differential pressure readings are obtained. If inlet sampling tube replacement or modifications do not yield proper differential pressure readings, the duct detector assembly shall be relocated at no additional cost to the Owner. Wiring of duct

detectors shall commence only after proper differential pressure readings have been obtained.

I. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated. Install at 80” above the highest floor level in the space or 6” below the ceiling, whichever is lower.

J. Visible Alarm-Indicating Devices: Install at 80” above the highest floor level in the space or 6” below the ceiling, whichever is lower. Install all devices at the same height unless otherwise indicated.

1. Adjust field selectable intensity level as called for on the drawings. Where specific intensity rating is not shown or noted on the drawings, set intensity per NFPA 72 requirements.

K. Fire Alarm System Wiring

1. Free-air cable installation:

a. Free-air installation shall not be permitted.

2. Non-free-air cable installation:

a. Non-free-air installation shall be required.
b. Cables shall be required to be installed in conduit.

3. All rough-in boxes and junction boxes shall be of sufficient size for the conduit and conductors entering the same.
4. All wiring shall be in accordance with the manufacturer's wiring diagram and recommendations.
5. All wiring shall be multiple conductor cables with individually insulated conductors and outer vinyl jacket. The individual conductors shall be color coded throughout the system.
6. All connections and power sources introduced into the fire alarm system via the auxiliary contacts of the smoke detectors and addressable interface modules shall be in strict accord with the fire alarm manufacturer's requirements and recommendations.
7. The sprinkler system flow switches will be provided by others. Wire flow switches into the system through addressable interface modules.
8. The following is a general description of the system wiring requirements:

a. Addressable Device Circuits: Two conductor, #18 AWG, twisted, shielded, cable.
b. Audible Alarm Circuit: Two conductor, #14 AWG, cable.
c. Visual Alarm Circuit: Two conductor, #14 AWG, cable.
d. Audible / Visual Alarm Circuit: Two conductor, #14 AWG, cable.
e. Transponder Panels: Two conductor, #18 AWG, twisted, shielded cable and two conductor, #14 AWG, cable.
f. 24 VDC Device Power: Two conductor, #14 AWG, cable.
g. Fan Stop Wiring: Two conductor, #14 AWG, THHN.
h. Fire Alarm Annunciator Panels: Two conductor, #18 AWG, twisted, shielded cable and two conductor, #14 AWG, cable.

L. Exterior Alarm Indicating Device: Provide exterior mounted fire alarm horn and visible indicating device. Unless otherwise shown or noted on the drawings, install the device at the Fire Department connection to the sprinkler system. Mount at 10 feet above finished grade unless architectural features require lower height, minimum mounting height: 8 feet, 6 inches above finished grade.

3.3 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighters' smoke-control system panel.
2. Smoke dampers in air ducts of designated HVAC duct systems.
3. Supervisory connections at valve supervisory switches.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.5 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

1. Test all existing fire alarm devices to ensure entire building has a fully-functioning, code-compliant fire alarm system.

D. Fire-alarm system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 24 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.8 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within [**two**] <**Insert number**> years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least [**30**] <**Insert number**> days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

SECTION 28 5200

SECURITY INTERCOMMUNICATION SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the security drawings:

1) Electrical equipment coordination and installation.
2) Common electrical installation requirements.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the security drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the security drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. 28 0500 – Common Work Results for Detention Security
2. 28 1116 – Security Racks, Frames, And Enclosures
3. 28 2000 – Video Surveillance
4. 28 5200 – Security Intercommunication System
5. 28 5211 – Detention Monitoring and Control Systems Hardware
6. 28 5213 – Detention Monitoring and Control Systems Software
7. 28 5215 – Auxiliary Systems Control
8. <**List sections that require direct coordination with this section**>

B. Installed but furnished by others:

1. Related Divisions 08 Sections:

a. Prepare doors and frames for electrified hardware and devices specified in this section
b. Coordinate templates and preparation of doors and frames for electrified hardware.
c. Coordinate hardware with the requirements of this section.

2. Related Division 11 Sections:

a. Coordinate templates and preparation of doors and frames for electrified hardware.
b. Coordinate power requirements for electric hardware with the requirements of this section.
c. Prepare doors and frames for electrified hardware and devices specified in this section.

3. 26 0519 - Low-Voltage Electrical Power Conductors and Cables
4. 26 0526 - Grounding and Bonding for Electrical Systems
5. 26 0533 - Raceways and Boxes for Electrical Systems
6. 26 0529 - Hangers and Supports for Electrical Systems
7. 26 5119 - LED Interior Lighting
8. <**List items that may be furnished by others, but installed by this contractor**>

1.3 SUMMARY

A. System Description

1. This Section includes the requirements for a Detention Intercommunication System. The detention intercommunication system shall be integrated with the overall Electronic Security System. The system shall be configured to support all intercom stations, speakers and touchscreen master modules in the system.
2. The ESSI shall provide an integrated detention intercommunication system as specified herein. The system shall include all equipment, installation materials, set up, and testing to form a complete operating system. Independent system functions and integrated system functions to be fully verified as part of system testing and commissioning.
3. The VGUI software shall be the primary interface for the control and monitoring of the detention intercommunication system.
4. The ESSI shall provide a digital interface between the PLC system and the Digital Communication Controllers for control by the PLC.
5. The ESSI shall remove and turn over to the Owner for their disposal all existing audio communications head-end equipment. In place of the existing equipment, the ESSI shall provide Digital Communication Controllers (DCCs), Digital Communication Expanders (DCEs) and all other necessary ancillary equipment in enough quantities to support all existing remote intercom station locations, existing speakers and new touchscreen master modules to provide a fully functional system. ESSI shall provide Quick Connect Boards and Interface Cables in sufficient quantities to terminate audio communications cabling.
6. Digital Communication Controllers and Digital Communication Expanders shall be interconnected to form intercom exchanges. Each Digital Communication Controller (DCC) shall be capable of supporting up to four Digital Communication Expanders (DCEs). The ESSI shall provide and install the required number of DCCs and DCEs to support the total number of intercom stations, ceiling speakers and touchscreen master modules in the system.
7. The system shall include station audio level alarm detection capability for all intercoms within the system located in detention cells. This shall feature adjustable detection settings for each individual station. ESSI shall include with their bid the head-end

equipment required to support this feature. The ESSI shall adjust the audio level alarm detection settings for each station, with input from the Owner.

8. The ESSI shall provide all hardware and software required to provide digital audio recording of the audio between all VGUI stations and intercom stations and speakers.

B. Section Includes:

1. Digital Communication Controllers
2. Digital Communication Expanders
3. Administrator Software
4. Discrete I/O Modules
5. Network Repeaters
6. Audio Master Stations
7. Call Operating Devices
8. Intercom Station Boards
9. Station Port Adapters
10. Intercom Stations
11. Talkback Expanders
12. Paging Amplifiers
13. Recessed Ceiling Paging Speakers, Non-Detention Areas
14. Surface mount paging speaker, non-detention areas
15. Wall mount page speaker, non-detention areas
16. Vandal proof ceiling speaker, detention area
17. Talk thru communicator
18. Exterior intercom pedestal
19. Loudspeakers
20. Accessories

1.4 DEFINITIONS

A. DCC: Digital Communication Controller

B. DCE: Digital Communication Expander

1.5 ACTION SUBMITTALS

A. Product Data: For components for detention intercommunication systems integration. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.

1. Outline Drawings: Indicate dimensions, weights, arrangement of components, and clearance and access requirements.
2. Control Panel Layout: At full scale, show device identification.
3. Wiring Diagrams: Detail specific power, control, signal, communication, and data wiring and cabling. Coordinate nomenclature and presentation with block diagram.
4. Raceway Riser Diagrams: Detail raceway runs required for detention intercommunication system monitoring and control and for systems integration. Include designation of devices connected by raceway, raceway type and size, and type and size of wire and cable fill for each raceway run.
5. Scaled location and layout of all field equipment on floor plans.

6. Large-scale floor plans and elevation view drawing to scale of all Security Electronic rooms and control rooms depicting all racks, consoles, cabinets, equipment, outlets, etc. This includes, but is not limited to:

    a. Functional diagram of integrated system.
    b. Functional diagram of each sub-system.
    c. Wiring diagrams showing wire and cable requirements for each piece of equipment. Include wire types and sizes. Include power, UPS and grounding requirements as well.
    d. Conduit and Wiring plan.
    e. Equipment schedule showing location and function of each device.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Functional Block Diagram: Show single-line interconnections between components including interconnections between components specified in this Section and those furnished under other Sections.

    a. Indicate methods used to achieve systems integration.
    b. Indicate control, signal, and data communication paths and identify PLCs, networks, control interface devices, and media to be used.
    c. Describe characteristics of network and other data communication lines.
    d. Describe methods used to protect against power outages and transient voltages including types and ratings of isolation and surge suppression devices used in data, communication, signal, control, and ac and dc power circuits.

B. Seismic Qualification Data: Submit certification that fabrication for completed equipment rack and control panel assemblies will withstand seismic forces defined in Section 27 0548.16 "Seismic Controls for Communications Systems." Include the following:

1. Description of features included in equipment and equipment assemblies to withstand anticipated acceleration loads.
2. Basis for Certification: Indicate whether withstand 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."

3. Dimensioned Outline Drawings of Equipment Racks and Control Panels: Identify center of gravity of fully equipped and assembled units and locate and describe mounting and anchorage provisions.
4. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

D. Other Information Submittals:

1. Examination reports documenting inspections of substrates, areas, and conditions.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For detention monitoring and control equipment components to include in emergency, operation, and maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Intercom Station: Furnish 2 spare intercom stations of each type provided.
2. Touchscreen Master Module: Furnish 1 spare touchscreen master module.

B. Provide adequate capacity in equipment to increase number of intercom stations in the future by 10 percent above those indicated for work of this project.

1.9 QUALITY ASSURANCE

A. All work shall conform to applicable National Electrical Codes (NEC). ESSI shall adhere to applicable state and local ordinances and the requirements of the authority having jurisdiction.

B. Intercom system equipment is to be designed and manufactured in accordance with ISO-9001 2000 Quality System Standard.

C. Manufacturer's quality control program to be registered in accordance with the above noted standard.

1.10 SERVICE CONDITIONS

A. Environmental Service Conditions: Systems, equipment, and components shall be capable of operating continuously in the following conditions without mechanical or electrical damage or degradation of operating capability:

1. Ambient Temperature: 140 deg F.
2. Relative Humidity: 10 to 95 percent, noncondensing.

B. Electrical Service Conditions: Equipment shall operate continuously in the following conditions without damage or degradation of operating capability:

1. Voltage Range for Equipment with a Nominal Rating of 120-V AC: 88 to 132 V.
2. Voltage Range for Equipment with a Nominal Rating of 24-V DC: 22 to 85 V.
3. Frequency Range for Equipment with a Nominal Frequency Rating of 60 Hz: 45 to 63 Hz.

1.11 WARRANTY

A. Warranty Period: 12 months from date of Substantial Completion. The manufacturer shall repair or replace software and hardware that fails in materials or workmanship within specified warranty period.

1.12 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Intercom Station: Furnish 2 spare intercom stations of each type provided.
2. Touchscreen Master Module: Furnish 1 spare touchscreen master module.

PART 2 - PRODUCTS

2.1 DIGITAL COMMUNICATION CONTROLLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harding MicroComm DXL Digital Communication Controller.

B. Description: ESSI shall provide required number of Digital Communication Controllers to form an intercom exchange capable of independent local operation. Each exchange capacity shall be increased as required by connecting additional Digital Communication Expanders (maximum of 4) to each DCC. The basis for the specification is Harding Instruments.

C. Digital Communication Controller (DCC):

1. Each DCC shall include the following:

a. Process Control Card (PCC)
b. Master Control Card (MCC)
c. Two Station Control Cards (SCC's)
d. Optional internal PCI card.
e. Front panel keypad/display for system setup and maintenance.
f. 110 VAC, 60 Hz power supply for internal functions.

D. Process Control Card (PCC):

1. Process Control Card shall contain system configuration and data, control exchange operations and switching, and provide exchange network ports.
2. PCC shall include the following:

a. USB network ports for exchange expansion.
b. Ethernet network ports for system expansion and external control by touch screen computers and graphic control panels.
c. Fiber optic or copper digital audio trunk ports.
d. Two serial ports.
e. Internal modem for transmitting and receiving data over a telephone line.

E. Master Control Card (MCC):

1. MCC shall include the following:

a. Include ports for any combination of two intercom or telephone set master stations.
b. Include two line-level audio inputs with status and control.
c. Include two line-level audio outputs with status and control.

d. Convert incoming audio signals to digital format and outgoing signals to analog format.
e. Intercom master station audio, press-to-talk and hook switch status transmitted over two single shielded pair cables with wiring supervision to detect open circuit and short circuit faults.
f. Telephone set master station functions all transmitted over a single wiring pair.

F. Station Control Card (SCC):

1. SCC's shall include the following:

a. Each provides sixteen half-duplex intercom station ports which can be employed in adjacent pairs for full duplex devices.
b. Provide an interface for intercom stations. Units to convert incoming audio signals to digital format and outgoing signals to analog format. Each channel to monitor the status of up to two (2) switches associated with each intercom station.
c. Each card interfaces with 16 half-duplex channels. Each channel includes a separate audio power amplifier for non-blocking call operation and sixteen (16) independent software controlled volume settings.
d. All station audio, switch, and power functions on 400 Series and 401 Series cards to be transmitted over a single shielded pair cable with supervision to detect open circuit and short circuit faults.
e. Audio and switch functions on 300 Series (Generic Intercom) station control cards to be transmitted on separate wiring pairs.

2.2 DIGITAL COMMUNICATION EXPANDERS (DCE)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harding MicroComm DXL Digital Communication Expander.

B. Description: Digital Communication Expanders to provide master station and intercom features similar to the DCCs to facilitate exchange expansion

1. Each DCE to include:

a. A Process Control Card (PCC) without exchange control or network functions.
b. A Master Control Card (MCC)
c. Two Station Control Cards (SCCs)
d. A 110 VAC, 60 Hz power supply for internal functions.

2.3 ADMINISTRATOR SOFTWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harding MicroComm DXL System Software.

B. Description: Administrator software shall be included with the detention intercommunication system. ESSI shall provide one licensed copy of the administrator software to the Owner at final completion. The basis for the specification is Harding Instruments.

1. Administrator Software to function on a standard PC to support system configuration, diagnostics, maintenance, and logging but not be required for system operation.
2. Administrator Software to employ Windows features including views of system tree structure, tables of devices, screens for system settings and adjustments, and tables of operational data.
3. Configuration features to include:

    a. Creation of overall system architecture.
    b. Creation of multiple device templates.
    c. Copy and paste functions with auto-numbering and auto-assignment to create device schedules.
    d. Configuration error detection and alerts.
    e. Device naming and call routing functions.
    f. Device setting and performance functions.

4. Diagnostic and Maintenance features to include:

    a. Verification of system configuration and installation.
    b. Verification of system networks.
    c. Verification of device connections.
    d. Verification of system operation.
    e. Diagnostics via modem or Ethernet ports.

5. Logging features to include:

    a. Display of system activity with filtering options.
    b. Search by time and date.
    c. Search by device.
    d. Search by parameter.

6. ESSI shall install a licensed copy of the Administrator software on the Security Management Server (SMS).

2.4 DISCRETE I/O MODULES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harding MicroComm DXL DIO relay modules.

B. Description:

1. Each Discrete I/O (input/output) module is to interface up to 48 contact closure type input monitor points and 48 solid-state (16 relay, 48 relay) output control points. Outputs are to be current sink (voltage source, LED driver, form C contact) type.
2. Inputs are to be supervised (non-supervised) for open circuit and short circuit faults in field wiring. With terminating resistors, each supervised input is able to monitor two contact points for a total of 96 inputs.
3. DIO modules to be rack or wall mounted.

2.5 NETWORK REPEATERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harding MicroComm DXL network repeaters.

B. Description:

1. Network repeaters are to extend LonWorks network cable limits or increase node limits. Each unit is to include four network ports. Data received on any port to be re-transmitted on the other ports.
2. Units to be surface wall mounted and include depluggable screw terminal connectors, redundant power supply connections and internal fuse to protect circuitry.
3. Six (6) LED's to indicate receiving port, network activity, and power supply status.

2.6 VoIP TOUCH SCREEN INTERCOM MASTER STATIONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harding MicroComm DXL TMM-641 master station.

B. Description: Desktop loudspeaker/microphone unit is to include compact, slim line bottom plate with stainless steel face, and rubber shock isolation mounting feet

1. Desktop loudspeaker/microphone unit is to include compact, slim line bottom plate with stainless steel face, and rubber shock isolation mounting feet.
2. Unit to include a 12 inch, black, slim line electret gooseneck (flush mounted electret) microphone, front mounted loudspeaker, front mounted rotary volume control, and front access headphone jack.
3. Unit to include support for a privacy handset.
4. Unit to include a line level audio output of the speaker signal.
5. The network connection shall be a 10/100Mbps (RJ45 connector) Ethernet port with support for IEEE 802.3af inline power. A separate power connector shall also be provided in case an IEEE 802.3af compliant Ethernet switch is not available. The master station shall also provide support for the IEEE 802.1p/Q Quality of Service (QoS) standard.
6. Unit to include a 2-port 10/100Mbps Ethernet switch to facilitate the connection of a second Ethernet device.

2.7 VoIP DESKTOP INTERCOM MASTER STATIONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harding MicroComm DXL IMS-640

B. Description: VoIP desktop intercom master stations shall consist of a display, keypads, internal speaker & microphone, telephone handset with hook switch, headset jack, and large visual alarm indicator.

1. VoIP desktop intercom master stations shall consist of a display, keypads, internal speaker & microphone, telephone handset with hook switch, headset jack, and large visual alarm indicator.
2. The display shall provide a 128x64 pixel graphical (backlit) LCD capable of displaying a "title" row, three "data" rows, and two "menu" selection rows of two fields each.
3. Four context sensitive "soft" keys shall be provided next to the "menu" selection rows (two on each side) to facilitate menu selections.
4. Four "navigation" keys shall be provided below the display to assist in navigating the menu system and to facilitate adjustment of various system settings.
5. A standard 12-key telephone as well as dedicated "Release", "Mic Mute", "Speaker", "Volume Up", and "Volume Down" keys shall be provided.
6. Fourteen programmable "feature" keys, each with an LED indicator shall be provided.
7. The VoIP master station shall provide an ADA compatible telephone handset with coiled cord, terminated on an RJ9 connector.
8. The VoIP master station shall be fabricated from ruggedized plastics and provide a scratch and impact resistant window for the display. A two position stand shall also be provided.
9. Overall dimensions (excluding the stand): 8.5" x 8" x 2".
10. The network connection shall be a 10/100Mbps (RJ45 connector) Ethernet port with support for IEEE 802.3af inline power. A separate power connector shall also be provided in case an IEEE 802.3af compliant Ethernet switch is not available. The master station shall also provide support for the IEEE 802.1p/Q Quality of Service (QoS) standard.

2.8 CALL OPERATING DEVICES (INTERCOM CALL BUTTON)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harding MicroComm DXL DS-COD-210-2.9 Call Operating Device

B. Description: Call operating devices to be pushbutton switch actuators that are software assignable to call request, call cancellation, acknowledge, event initiation or other similar system function

1. Units to be constructed with single gang 11 gauge brushed stainless steel faceplate suitable for mounting on standard single gang outlet box.
2. Pushbuttons to be vandal resistant and constructed of stainless steel. (Call cord to be 6' long pushbutton type with molded connectors).

2.9 INTERCOM STATION BOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harding MicroComm DXL DS-ICB-400-2.13

B. Description: Intercom station boards are to be used to interface generic intercom stations and loudspeakers to system station audio boards for two-way voice communication or audio monitoring.

1. Units are to include microphone preamplifier, line supervision electronics, multiplexing electronics, and loudspeaker transformer.
2. Units are to include pigtail and switch options as required for each location.

2.10 QUICK CONNECT BOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harding MicroComm DXL QCB series.

B. Description: Quick Connect Boards are designed with a female DB connector to connect a cable from the station control card ports to screw clamp terminals that terminate the field wiring

1. QCB-120-1 connects the audio port of either the SCC-300 or SCC-400/401 station control card to the field wiring.
2. QCB-120-2 connects the switch ports of an SCC-300 station control card to the field wiring.
3. QCB-120-5 is a 16-channel QCB that interfaces the output from a SCC-300 station control card to 45 ohm speakers.
4. QCB-120-6 is a 16 channel QCB, used in conjunction with up to four quick connect adapters QCA-120, converts the audio output from a SCC-300 or SCC-400/401 station control card to a line-level output or converts a line-level input to a audio levels compatible with SCC-300 or SCC-400/401 station control cards. Individual channels can be set to act as line-level inputs or line-level outputs.

2.11 STATION PORT ADAPTER

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harding MicroComm DXL DS-SPA-120-1.4

B. Description: Station Port Adapter provides a line-level output for use with external paging amplifiers.

1. Provides a single line-level output.
2. Provides a single control output (when connected to a 400 or 401 series station card audio port).
3. Screw terminal connections.
4. Station Port Adapter (SPA-120-1) provides a line-level input for use with external line level audio sources.
5. Provides a single line-level input.
6. Screw terminal connections.

2.12 VoIP INTERCOM STATIONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harding MicroComm DXL ICE630 series intercom

B. Description: VoIP intercom stations are half-duplex VoIP intercoms that connect to a VoIP capable intercom system. These stations conform to the industry standard SIP protocol and are available with a wide range of standard features.

1. VoIP Intercom stations are to be designed for mounting on standard 3-gang outlet boxes. Faceplates to be constructed of 11-gauge brushed stainless. Internal steel offset grille to restrict inserting objects through speaker grille. Stations to be ruggedly constructed and resistant to damage from soil and sprays.
2. Each intercom station is to incorporate an internal loudspeaker, microphone preamplifier, and network interface circuitry. One pushbutton is to be provided on each station.
3. Pushbuttons to be software assignable for placement of call requests or control of auxiliary functions.
4. Pushbuttons to be vandal resistant and constructed of stainless steel. Switch to have positive tactile action with 1 million-operation lifetime. (Pushbuttons to be solid metal piezo-electric type with no moving parts and a 50 million operation lifetime).
5. Loudspeakers to be waterproof mylar cone type.
6. Unit to include 2 status inputs, 1 status output, and 1 line level audio output. Line output to be configurable as a speaker output or a mix of the speaker and microphone signals.
7. The network connection shall be a 10/100Mbps (RJ45 connector) Ethernet port with support for IEEE 802.3af inline power. A separate power connector shall also be provided in case an IEEE 802.3af compliant Ethernet switch is not available. The master station shall also provide support for the IEEE 802.1p/Q Quality of Service (QoS) standard.
8. Outdoor intercom stations are to be identical in all respects to standard intercom stations except that all metal plates and hardware to be stainless steel, and internal circuitry and components to be conformally coated.

2.13 INTERCOM STATION BOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harding MicroComm DXL IEB-400 intercom board.

B. Description: Intercom station boards to be used to interface generic intercom stations and loudspeakers to system station audio boards for two-way voice communication or audio monitoring.

1. Units to include microphone preamplifier, line supervision electronics, multiplexing electronics, and loudspeaker transformer.
2. Units to include pigtail and switch options as required for each location.

2.14 TALKBACK EXPANDERS (TBEs)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harding MicroComm DXL TBE-310

B. Description:

1. Talkback Expanders to provide 8 amplified paging outputs that can drive 25 Vrms loudspeaker circuits.
2. Each TBE is to

    a. Provide 5 watts output per channel
    b. Allow adjacent channels to be bridged to obtain higher power.
    c. Provide talkback capability on all channels.
    d. Include Audio Level Alarm capability on all channels.

2.15 PAGING AMPLIFIER

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Harding MicroComm
2. Stentofon
3. Atlas Sound
4. Bogen
5. Select output power based on load requirements. Amplifiers sized for 25% additional growth. Provide rack mounting hardware, input modules, and impedance matching transformers as required.

B. Description: Paging amplifier used to amplify audio signal for distribution over paging speaker system.

1. Output rating: 60 and 125 W continuous (rms), 25V
2. Frequency response: 20Hz to 20kHz (+0, -1dB) per EIA SE101-A
3. Harmonic distortion: < 0.5%, 45Hz to 20kHz at rated output
4. Signal to noise: >-90dB below rated output (20Hz to 20kHz bandwidth)
5. Input sensitivity: 1.0 V (rms) @ 1kHz for rated output
6. Input impedance: 75k ohms
7. Output impedance: 10.4 ohms (25V) balanced
8. Regulation: Better than 1dB no load to full load
9. Terminations: Screw terminals w/ barriers on outputs

2.16 RECESSED CEILING PAGING SPEAKERS, NON-DETENTION AREAS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Soundolier FAP42T Strategy Series II speaker system package.

B. Description: Recessed ceiling paging speaker for non-detention areas. Include speaker, back box enclosure, baffle, and Tile Bridge

1. Continuous Power Rating: 25 watts
2. Frequency: 110 - 20KHz
3. Impedance: 8 ohms
4. Sensitivity: 88 dB, Avg./ 92 dB, Peak
5. Coaxial: ½' post mounted domed tweeter, 4-inch paper cone speaker with poly-ether foam surround and a 10 oz magnet.
6. Primary Voltage: 70.7 volts
7. Frequency Response: +/- 1 dB, 50-15 kHz
8. Primary Taps: 1, 2, 4, and 8 watts
9. Secondary Impedance: 4 and 8 ohms
10. Insertion Loss: .6 dB
11. Enclosure Diameter: 5-3/8"
12. Enclosure Depth: 7-5/8"
13. Flange Diameter: 7-9/16"
14. Internal Volume: .1 cubic feet
15. Tile Bridge: 24-gauge electro-galvanized steel.
16. Baffle: Perforated steel with welded/serrated studs for push on installation

2.17 SURFACE MOUNT PAGING SPEAKER, NON-DETENTION AREAS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atlas Sound SBMS series speaker system.

B. Description: Surface mounted paging speaker for non-detention areas. Typical of locations where paging speaker shall be mounted to exposed structure.

1. Power Rating: 25 watts (transformer limited)
2. Tap Settings: 70V .25, .5, 1, 2, and 4 watts
3. Frequency Response: 85 Hz - 20 k Hz
4. Sensitivity: 92 dB 1W/1M
5. Cone: 8" dual cone
6. Magnet: 10 oz.
7. Dimensions: 11 ½" x 11 ½" x 5 ½"
8. Assembly: CRS constructed enclosure

2.18 WALL MOUNT PAGE SPEAKER, NON-DETENTION AREAS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atlas Sound AP-15T loudspeaker.

B. Description:

1. Power Taps: 1, 2, 3.8, 7.5, 15 watts at 70V
2. Frequency Response: 400 Hz to 14 kHz
3. Dispersion: 70 degrees
4. Sensitivity: 106 dB
5. Power Rating: 15 watts

2.19 VANDAL PROOF CEILING SPEAKER, DETENTION AREA

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atlas Sound SD72 speaker transformer package with VP161A-R8 recessed square baffle and 193-8-6 steel enclosure.

B. Specifications

1. Speaker Type: 8" dual cone.
2. Magnet Weight: 10 oz.
3. Sensitivity: 97 dB.
4. Frequency Response: 65 Hz to 20 kHz.
5. Insertion Loss: 1.5 db.
6. Transformer: 25/70 volt.
7. Primary Taps: .25, .5, 1, 2, 5.

2.20 TALK THRU COMMUNICATOR

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Haven Electronic SC300.

B. Description: Electronic two-way, hands-free audio communications (duplex) between a partition.

1. Equipped with a factory adjusted VOX switch to prevent ambient noise (below 85 decibels) from activating the unit.
2. Contains two voice channels, each incorporating a microphone amplifier, VOX switch, compressor, and a power amplifier.
3. The sound amplifier does not exceed a 0.2% total harmonic distortion rating.
4. Fully operational between 0C and 50C.
5. Comes with an AC/DC power supply (120V AC stepped down to filtered 12V DC) and a 1-year warranty
6. Two-way communication is accomplished through the use of speakers and microphones located on each side of the partition. The master unit is equipped with a 20" gooseneck microphone, power on/off switch, power-on LED, and external volume controls. The Remote unit is vandal-resistant with all controls located within the housing
7. Rugged Aluminum Construction
8. Duplex Communication
9. Voice Activated Switch
10. Background Noise Level Monitoring
11. Level Detection and Attenuation Control
12. Linear Volume Control
13. Dimensions: 4"w x 8"h

2.21 EXTERIOR INTERCOM PEDESTAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Engineered Parking Systems Dual Height custom S3S31272/43 Style 3 pedestal for car and truck traffic.

B. Description: steel pedestal intended for mounting of electronic devices at location outside and away from building structure.

1. 2"x4" rectangular steel tubing
2. 8"x8" baseplate
3. Steel baseplate cover
4. 6'x6" mounting plate for housing.
5. Painted white
6. 8" tall x 12" wide x 6" deep housing with keyed door and shroud.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify the accuracy of all dimensions, allowances, and clearances on site prior to commencing with any work that may be affected by those dimensions, allowances, and clearances.

B. Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in the Contract Documents.

C. Precautions shall be taken to guard against electrostatic and electromagnetic susceptibility and interference.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Wiring Method:

1. Free-air cable installation:

   a. Free-air installation shall be permitted in spaces with lay-in ceilings, and in non-finished spaces without ceilings (exposed structure).
   b. Suspend cable not in a wireway or pathway a minimum of 8 inches above ceiling by cable supports not more than 60 inches apart.
   c. Cable shall not be routed through structural members or be in contact with pipes, ducts, or other potentially damaging items.

2. Non-free-air cable installation:

   a. Non-free-air installation shall be required in finished, occupied spaces without ceilings (exposed structure).
   b. Cables required to be installed in conduit or cable tray. No visible, free-air installations shall be acceptable.
   c. Cables installed above gypsum board ceilings (or other "hard", non-accessible ceilings), are required to be installed in conduit stubbed, on both ends, to an accessible location.

3. Install plenum cable in environmental air spaces, including plenum ceilings.

B. Provide complete detention intercommunication system as specified herein.

C. All material furnished shall be new and conform to the applicable requirements of the Underwriters Laboratories and the National Standards Institute.

D. All system equipment to be contained within equipment racks or cabinets.

E. Provide adequate ventilation for all heat radiating equipment. ESSI shall provide fan kits as required to maintain rated operating temperature of installed equipment.

F. All system equipment and field devices to be held securely in place. Fastenings and supports shall be selected to provide a safety factor of three.

G. All system equipment equipped with plug in power connectors to be connected to a dedicated receptacle. Do not use tap connectors for plugging in multiple plugs into a single receptacle.

H. All cable within equipment racks, and cabinets, or on backboards, to be neatly bundled and secured.

I. Wires shall not be nicked, have strands removed, or have frayed strands when removing insulation or terminating.

J. Wiring shall be executed in strict adherence to standard broadcast practices.

K. All field device cables terminating to quick connector boards shall be labeled for easy identification.

3.3 CONNECTIONS

A. All detention intercommunication system equipment connections shall be completed per manufacturer's recommendations and per ESSI shop drawings.

B. Ground equipment according to manufacturer's recommendations.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare pass/fail reports:

1. The System shall be completely tested to assure that all components are hooked up and in working order. The System shall be adjusted for optimum intelligibility at peak amplifier output before audio signal clipping occurs. Inspect communications quality between each remote device and master station for buzzes, rattles and audio distortion. Correct all causes of such defects. If the cause is outside of the intercom system, promptly notify the Architect in writing, indicating the cause of the defect and suggested corrective procedures.
2. The System shall be pre-tested by the security equipment contractor and certified, in writing, to function in accordance with the plans and specification.
3. The contractor is to verify the system is communicating with all controlled devices.
4. Testing to be performed in the Contractors shop prior to delivery-

    a. Test 120VAC power equipment and hardware internal to all equipment racks. Test all conductors for shorts, opens, and polarity.
    b. Fully charge all UPS systems that apply to this system. Test unit by removing power thereby causing the unit to switch to battery reserve.
    c. Perform impedance sweeps on all speakers.Verify results fall within manufacturer's specifications.
    d. Adjust all source level control components and signal processing for optimal gain structure. All components shall be set so they clip simultaneously.

5. Testing to be performed at the job site prior to powering the system

    a. Verify correct polarity of all microphone inputs, line level inputs, and speaker cables.
    b. Verify all microphone inputs, line level inputs, and speaker cables are free of shorts and opens prior to termination of head end electronics.

c. Repeat impedance sweeps on all speaker systems after they are installed and terminated. Include speaker cable in testing.
d. Test all 120VAC power sources for correct polarity and voltage. Test grounding system for continuity. Notify Electrical Contractor of any problems.

6. Additional job site testing

a. After installation of head end electronics, verify polarity of signal throughout system.
b. Finalize gain structure of system. Adjust system gain and level so that all components clip at the same time. Adjust so system noise is minimized.
c. Adjust all speaker components for consistency in sound pressure level.

7. Prior to termination of head-end electronics, verify that all speaker lines are free from shorts and opens.
8. Utilizing an impedance meter run test tone through speaker system verifying that all speakers are functioning properly.
9. Terminate head end electronics. Run test tone through system verifying adequate gain structure through electronic signal path.
10. Using a sound level meter, confirm variation in sound pressure level is not more than +/-5 db in all areas. Adjust speaker taps to insure consistency in sound pressure levels throughout the facility.
11. Adjust overall sound pressure level so minimum level is 10 dB above ambient noise level for facility during normal operating conditions.
12. The System shall be completely tested to assure that all components are hooked up and in working order. The System shall be adjusted for optimum intelligibility at peak amplifier output before audio signal clipping occurs. Inspect system for defects. Correct all causes of such defects. If the cause is outside of the scope of the Div 28 series scope of work, promptly notify the Architect in writing, indicating the cause of the defect and suggested corrective procedures.
13. The system shall be capable of operating free of hums, buzzes, and rattles under normal operating conditions.
14. Provide written documentation showing all test results.
15. The System shall be final tested in the presence of the Architect. Contractor is to provide all required testing equipment.

3.5 ADJUSTING

A. ESSI shall provide detention intercommunication system configuration and adjustments. All intercom stations, loudspeakers and audio master stations shall be adjusted for optimum performance.

3.6 DEMONSTRATION

A. Provide qualified personnel to train Owner's maintenance personnel to adjust, operate, and maintain the security intercommunication system.

END OF SECTION

SECTION 28 5211

DETENTION MONITORING AND CONTROL SYSTEMS HARDWARE

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the security drawings:

1) Electrical equipment coordination and installation.
2) Common electrical installation requirements.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the security drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the security drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. 28 0500 – Common Work Results for Detention Security
2. 28 1116 – Security Racks, Frames, And Enclosures
3. 28 2000 – Video Surveillance
4. 28 5200 – Security Intercommunication System
5. 28 5211 – Detention Monitoring and Control Systems Hardware
6. 28 5213 – Detention Monitoring and Control Systems Software
7. 28 5215 – Auxiliary Systems Control
8. <**List sections that require direct coordination with this section**>

B. Installed but furnished by others:

1. Related Divisions 08 Sections:

a. Prepare doors and frames for electrified hardware and devices specified in this section
b. Coordinate templates and preparation of doors and frames for electrified hardware.
c. Coordinate hardware with the requirements of this section.

2. Related Division 11 Sections:

a. Coordinate templates and preparation of doors and frames for electrified hardware.
b. Coordinate power requirements for electric hardware with the requirements of this section.
c. Prepare doors and frames for electrified hardware and devices specified in this section.

3. 26 0519 - Low-Voltage Electrical Power Conductors and Cables
4. 26 0526 - Grounding and Bonding for Electrical Systems
5. 26 0533 - Raceways and Boxes for Electrical Systems
6. 26 0529 - Hangers and Supports for Electrical Systems
7. 26 5119 - LED Interior Lighting
8. <**List items that may be furnished by others, but installed by this contractor**>

1.3 SUMMARY

A. System Description

1. The Electronic Security System Integrator (ESSI) shall be responsible for providing a complete electronic security system. The security automation system shall be comprised of one or more programmable controllers, communications networks and operator interfaces. This system shall provide the necessary remote I/O, power supplies, input modules, output modules and any other required equipment to provide a fully functional system. The system will receive discrete inputs, and through the use of an internal control logic program, control output relay operations and perform remote control functions via the Video Graphic User Interfaces (VGUI).
2. The detention monitoring and control system shall control all electrically operated door hardware, monitor all doors, bolt position limit switches, and annunciation of all door status and alarms upon violation. Intercoms, paging, duress, card access, and video surveillance control shall be integrated into the security systems as well as fire emergency release provisions for the holding areas.
3. Control of the system shall be via video graphic user interfaces (VGUI) and graphic control panels located as per the drawings.
4. All detention monitoring and control system's actions shall be recorded onto a Security Management Server (SMS) database.
5. The ESSI shall provide all labor, equipment, materials and supervision to install, program, calibrate, adjust, document, and test the total system as required herein, as shown on the drawings and required for the complete integration of the security system.
6. Each utility control panel, PLC Security Equipment Cabinet (SEC) and audio equipment rack shall be applied with a UL 508A Listing Mark. This UL 508A Listing Mark shall be applied by only the pre-qualified ESSI. No outside marking facility will be accepted. Door control and monitoring cabinets shall not be UL 508A labeled.

B. Section Includes:

1. Computers for VGUI and SMS.
2. Monitors for VGUI and SMS computers.
3. PLC system.

4. Relays.
5. Component protection.
6. Dedicated UPS.
7. Cables.
8. Accessories.

1.4 DEFINITIONS

A. DEC: Detention Equipment Contractor

B. ESSI: Electronic Security System Integrator

C. I/O: Input/output.

D. LAN: Local Area Network.

E. LED: Light-emitting diode.

F. Monitoring: Acquisition, processing, communication, and display of system and equipment status data and event and alarm signals.

G. MOV: Metal-oxide varistor.

H. Nonsecure: Closed and locked and with no unlock or open commands pending. (For doors and gates.)

I. PLC: Programmable logic controller.

J. Secure: Unlocked or open. (For doors and gates.)

K. SEC: Security Equipment Cabinet

L. SMS: Security Management System

M. Systems Integration: The bringing together of components of several systems containing interacting components to achieve indicated functional operation of combined systems.

N. VGUI: Video Graphic User Interface

O. Zone: A space or area defined on Drawings for a specific purpose.

1.5 ACTION SUBMITTALS

A. Product Data: For components for detention monitoring and control and systems integration. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.

1. Outline Drawings: Indicate dimensions, weights, arrangement of components, and clearance and access requirements.
2. Control Panel Layout: At full scale, show required artwork and device identification.

3. Wiring Diagrams: Detail specific power, control, signal, communication, and data wiring and cabling. Coordinate nomenclature and presentation with block diagram.
4. Raceway Riser Diagrams: Detail raceway runs required for detention monitoring and control and for systems integration. Include designation of devices connected by raceway, raceway type and size, and type and size of wire and cable fill for each raceway run.
5. Scaled location and layout of all field equipment on floor plans.
6. Large-scale floor plans and elevation view drawing to scale of all Security Electronic rooms and control rooms depicting all racks, consoles, cabinets, equipment, outlets, etc. This includes, but is not limited to:

    a. Functional diagram of integrated system.
    b. Functional diagram of each sub-system.
    c. Wiring diagrams showing wire and cable requirements for each piece of equipment. Include wire types and sizes. Include power, UPS and grounding requirements as well.
    d. Conduit and Wiring plan.
    e. Equipment schedule showing location and function of each device.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Functional Block Diagram: Show single-line interconnections between components including interconnections between components specified in this Section and those furnished under other Sections.

    a. Indicate methods used to achieve systems integration.
    b. Indicate control, signal, and data communication paths and identify PLCs, networks, control interface devices, and media to be used.
    c. Describe characteristics of network and other data communication lines.
    d. Describe methods used to protect against power outages and transient voltages including types and ratings of isolation and surge suppression devices used in data, communication, signal, control, and ac and dc power circuits.

B. Seismic Qualification Data: Submit certification that fabrication for completed equipment rack and control panel assemblies will withstand seismic forces defined in Section 27 0548.16 "Seismic Controls for Communications Systems." Include the following:

1. Description of features included in equipment and equipment assemblies to withstand anticipated acceleration loads.
2. Basis for Certification: Indicate whether withstand 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."

3. Dimensioned Outline Drawings of Equipment Racks and Control Panels: Identify center of gravity of fully equipped and assembled units and locate and describe mounting and anchorage provisions.

4. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

D. Other Information Submittals:

1. Examination reports documenting inspections of substrates, areas, and conditions.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For detention monitoring and control equipment components to include in emergency, operation, and maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Touch screen operator station including monitor, keyboard, speakers, CPU.
2. Fuses: A quantity equal to 10 percent of each type and rating indicated, but no fewer than 1 of each.
3. Fuse Blocks: Four of each type used.
4. Power Supplies: One of each type installed.
5. Network Interface Cards: One of each type installed.
6. Relays: Two of each type used.
7. Wire and Cable Terminals: Five of each type and size used.
8. PLC Processor: One of each type and configuration used.
9. PLC I/O Modules: One of each type and configuration used.
10. PLC Power Supply: One of each type and configuration used.
11. Card Reader: One of each type and configuration used.
12. Duress Alarm: One of each type and configuration used.
13. Request to exit push button: One of each type and configuration used.
14. Visitation handset: One of each type and configuration used.

B. Provide adequate capacity in equipment racks/cabinets, PLC, relay capacity and spare terminal to increase number of control points in the future by 10 percent above those indicated for work of this project.

1.9 QUALITY ASSURANCE

A. Supply only non-proprietary equipment. For equipment to be considered non-proprietary it shall be manufactured by a company that has produced a product line of compatible products for at least fifteen years and shall have a minimum of two in-state distributors with annual sales over one hundred thousand dollars.

B. The ESSI supplying the equipment shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system, including replacement parts. The ESSI shall be prepared to offer a service contract for the maintenance of the system after the guarantee period. The ESSI shall produce evidence that he/she has had a fully experienced and established service organization with at least ten years and proven satisfactory installations during that time.

C. Furnish and install only new equipment and materials required (less than 1 year from manufacturer), unused without blemish or defect.

D. All equipment of the same type shall be the product of one manufacturer.

E. Submit all items necessary to obtain all required permits and licenses to the appropriate Regulatory Agencies.

F. All work shall conform to the National Electrical Code (NEC) and to applicable National Fire Protection Association (NFPA) codes.

G. All work shall conform to all federal, state and local ordinances.

H. Where applicable, all fixtures, equipment, and materials shall be as approved or listed by the following:

1. Factory Mutual Laboratories (FM)
2. Underwriters Laboratories (UL)
3. National Electrical Manufacturers Association (NEMA).
4. Include all items of labor and material required to comply with such standards and codes. Where quantity, sizes or other requirements indicated on drawings or herein specified are in excess of the standard or code requirements, the specifications or drawings respectively, shall govern.
5. In addition, all SECs and racks capable of being labeled shall be have an UL508A listing mark. This labeling must be provided by the ESSI at their assembly facility. No third-party listings shall be considered.

1.10 SERVICE CONDITIONS

A. Environmental Service Conditions: Systems, equipment, and components shall be capable of operating continuously in the following conditions without mechanical or electrical damage or degradation of operating capability:

1. Ambient Temperature: 140 deg F.
2. Relative Humidity: 10 to 95 percent, noncondensing.

B. Electrical Service Conditions: Equipment shall operate continuously in the following conditions without damage or degradation of operating capability:

1. Voltage Range for Equipment with a Nominal Rating of 120-V AC: 88 to 132 V.
2. Voltage Range for Equipment with a Nominal Rating of 24-V DC: 22 to 85 V.
3. Frequency Range for Equipment with a Nominal Frequency Rating of 60 Hz: 45 to 63 Hz.

PART 2 - PRODUCTS

2.1 GENERAL SYSTEM REQUIREMENTS

A. Provide a complete and fully functional Detention Monitoring and Control System using materials and equipment of types, sizes and rating, as required to meet performance requirements. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated

system, with components and interconnections matched for optimum performance of specified functions.

B. The PLCs and all components in the system shall be industrial grade. All assemblies and sub-assemblies performing similar functions in separate controllers purchased under this specification shall be interchangeable. The PLC processors shall be configured as a hot-redundant system in conjunction with the VGUI. All components of the PLC system shall be by the same manufacturer, no mixing of multiple manufacturers shall be considered.

C. All components shall be housed in structurally sound and finished metal cabinets. All switches and other operator-controlled devices shall be of the size and durability for their intended use as is normally offered for industrial applications.

D. Modular components of the system shall be listed or recognized by a nationally recognized testing laboratory.

E. The programmable controller shall be housed in lockable enclosures hereafter referred to as Security Equipment Cabinets (SEC). The equipment cabinets or racks shall house the following items:

1. Input and output modules related to the monitoring and control of doors, lights, intercoms, CCTV, utility control functions, watch tour stations and duress alarm annunciation.
2. Regulated power supplies.
3. Terminal strips and fusing. Fuse holders shall be manufactured by Phoenix Contacts, Sprecher, Schuh or Square D and shall provide indication when the fuse has blown. Fuses shall be rated for the specific load. Each door shall be equipped with a minimum of two fuses, all output voltage for door control and indication shall be fused independently.
4. The programmable controller, or where applicable, transmitting and receiving modules to communicate with the PLC or remote input and output racks.
5. The intercom amplifiers and switching relays.
6. Other necessary items as determined by the ESSI design.

F. All Inputs and Outputs of the integrated system shall go through the input and output cards of the PLC. Direct connection to LED's, relays or other devices will not be acceptable.

G. Door monitoring and Control: Lock bolt and door position switches, provided by others shall be monitored as separate and distinct inputs (provide a minimum of 2 inputs per door). No series connections between the lock bolt and door position switches shall be considered. Each door shall be equipped with a minimum of two fuses, all output voltage for door control and indication shall be fused independently.

H. Locks, whether solenoid, motor drive types and other required devices such as elevator interface, corridor indicator lights shall be controlled via mechanical interposing relay driven by the PLC. All interposing relays shall be included with an LED to indicate when the relay is energized. Provide all required power to control doors. If DC power supplies are required, provide only Class 2 power supplies, and design the system so that the total ampacity shall be 100% greater than the worst case connected load, including inrushes. Group or emergency openings of doors shall cause doors to sequentially open with no more than 3 doors opening simultaneously.

I. Door interlock functionality shall be achieved via software. Any door shall have the ability to be programmed to become a member of an interlock scheme. The architect shall reserve the right to redefine interlocks during the submittal and shakedown phase without additional costs. Refer to plans for interlock groups.

J. Upon a loss of power, all doors shall de-energize. Sliding and overhead doors shall remain in their present state.

2.2 COMPUTERS FOR VGUI AND SMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. OnLogic.
2. Teguar.
3. Dell.

B. Description: VGUI and SMS Computers shall be industrial, fanless computers configured as follows:

1. CPU: IBM-compatible computer housed in an industrial chassis and having the following requirements:

a. CPU: Intel Core i7-8665UE processor or better.
b. RAM: 16 GB SO-DIMMDDR4 3200.
c. Fixed Disk Drive: 256 GB M.2 22x60 MLC SSD.
d. Operating System: Windows 10 Professional, 64 Bit.

2. Accessories. Provide each computer with wired keyboard & mouse from Logitech, HP or Dell.

2.3 MONITORS FOR VGUI AND SMS COMPUTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. NEC.
2. HP.
3. Elo.

B. VGUI Monitor:

1. Provide for each VGUI operator station a 24” TFT active LCD Flat Panel, touch screen with 1920x1080 resolution and support for Multi-Touch technology.

C. SMS Monitor

1. Provide standard 24” LCD color monitors capable of resolution of 1920x1080 pixels with refresh rates of 75Hz. It shall be capable of 32 colors in graphics mode.

2.4 PLC SYSTEM

A. General-Purpose PLCs:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allen-Bradley/Rockwell Automation.
b. Emerson Electric Co. (GE Intelligent Platforms).
c. OMRON Corporation.
d. Modicon.
e. Square D.

B. Description: Modular, generic PLCs manufactured for, and in general use in, general-purpose industrial applications; complete with controllers, power supplies, I/O modules, communication links, and housings. Minimum features and functionality include the following:

1. Characteristics: Adequate memory, software, I/O connections, communication capabilities, power capacity, and logic and timing functions to meet indicated requirements.
2. Each PLC shall be password protected against unauthorized entry to software.
3. Local and remote networking shall be via dedicated interface modules providing serial communications at rates, which are selectable from 62.5K to 1M, bits per second. The interface modules shall be capable of I/O drops at distances of up to 7,500 feet and control up to 32 remotes.
4. I/O Modules shall be optically isolated and designed to accept an input signal of 24 volts AC or DC. These modules shall be rack mountable. Each input point shall have a corresponding red LED indicator on the upper front of the module, which illuminates when the input is read by the microprocessor. These modules shall be configured in 16 or 32 inputs.
5. Communication between the PLC and the computer(s) shall be a peer to peer network; no master station (central hub or server) shall be required.
6. There shall be no noticeable delay between any VGUI icon or field device input and the resulting output on the video graphic user interface or in the field.
7. Dip Switch Programming is not acceptable.
8. No proprietary PLC system shall be acceptable. Each PLC shall be a standard industrial grade product designed for high reliability. The PLC shall be manufactured by a company that has produced a product line of compatible PLCs for at least fifteen years and has a minimum of two Iowa distributors with annual sales over one hundred thousand dollars.
9. Controller and I/O Uniformity: Manufacturer's different models shall be compatible, sharing common mounting centers, commands, control language, instruction code, and I/O structure.
10. I/O Modules: Same manufacturer as PLCs and applicable within the full range of manufacturer's controller models.
11. Controller EPROM: Stores system application program, operating software, and fixed database.
12. Controller General-Purpose RAM: Provides operational memory and storage for operating database. RAM is backed up by lithium battery of adequate capacity for a 12-month outage.
13. PLC and Local I/O Power Supply: Regulated dc unit located in the same rack enclosure as units it serves; with 24-V output. Include the following features:

    a. Capacity: 150 percent of load.
    b. Voltage Control and Protection: Remote sensing of voltage at load and internal overvoltage protection.
    c. Fault Protection: Fuses and inherent design protect against short circuit and overload, including shorting of either leg of dc output to conductive material energized intentionally or through malfunction at 120 V.
    d. Surge Protection: Protect the power supply and its I/O circuits in all modes of operation.

14. PLC and Local I/O Device Mounting: Rack mounting in ventilated enclosures.

2.5 RELAYS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Allen-Bradley/Rockwell Automation.
   b. Emerson Electric Co. (GE Intelligent Platforms).
   c. OMRON Corporation.
   d. Eaton.

B. Description: Plug-in, [**electromagnetic**] [**solid-state electronic**] [**electromagnetic or solid-state electronic**] units. Arrange in relay assemblies that have the following features:

   1. Fuse and SPD protection.
   2. Indicating LED for each relay.
   3. Optical isolation of input circuits to [**1500**] [**2500**] [**7500**] V.

C. Rating: A minimum of [**125**] [**150**] percent of the inrush current of controlled device, but not less than 6 A.

2.6 COMPONENT PROTECTION

A. Surge Protection: Protect components from voltage surges originating external to equipment housings and entering through power, communication, signal, control, and sensing leads. Include surge protection for external wiring of each conductor entry connecting to components.

   1. Minimum Protection for AC Power Circuits 120 V and More: Multistage surge suppressors, listed under UL 1449, using a combination of inductors and silicon avalanche diodes or equivalent, and with 300-V suppression level and 5-nanosecond maximum response time.

      a. Silicon Avalanche Diodes: Bipolar, Grade A, plus or minus 5 percent tolerance.
      b. Discrete SPD Units External to Protected Equipment: Enclosed modules with indicating lights labeled "power on" and "failure."

   2. Minimum Protection for Communication, Signal, Data, Control, and Low-Voltage Power Circuits: [**Silicon avalanche diode**] [**Gas-discharge**] [**MOV**] [**Silicon avalanche diode, gas-discharge, or MOV**]-type arresters rated 90 V at 5000 A[**, or optical isolation,**] [**or as recommended by equipment manufacturer**].

B. Interference Protection: Component function shall be unaffected by radiated-radio-frequency interference and electrical induction of 15 V/m over a frequency range of 10 to 10,000 MHz, or by conducted interference signals up to 0.25-V RMS injected into power supply lines at 10 to 10,000 MHz.

2.7 DEDICATED UPS

A. Description: Single-phase units, rated 120 V, 60-Hz input and output, complying with requirements for UPS-type central battery inverters in Section 263323.11 "Central Battery Equipment for Emergency Lighting" and with the following:

   1. Capacity: Adequate to supply full connected load for a minimum of [**four hours**] <**Insert required duration**>.
   2. SPD: Comply with UL 1449. Provide let-through voltage of 300 V or less.

3. Annunciation of UPS malfunction at control panel.
4. Connected Loads: PLCs and I/O modules both local and remote; operating, control, and indicating power supplies for control panels; and <**Insert UPS loads**>.

2.8 WALL DURESS STATION

A. Description: Wall-mounted push-button to generate an alarm on the VGUI system.

1. Mounts to a standard 1-gang metal box, 3 ½ inches in depth. The faceplate shall be stainless steel and be secured to the back box with tamper proof screws.
2. The push button shall be a red mushroom head with key switch manufactured by Square D.
3. This station shall be labeled "push for help".
4. The alarm signal provided to the PLC shall be from the closure of a normally closed dry contact.
5. Wall duress stations shall be by Telemecanique or approved equal.

2.9 DOOR RELEASE PUSH BUTTON

A. Description: Wall-mounted push-button to release electric lock.

1. This station shall mount to a standard 1-gang metal box, 3 ½ inches in depth. The faceplate shall be stainless steel and be secured to the back box with tamper proof screws.
2. The push button shall be a blue mushroom head manufactured by Square D.
3. This station shall be labeled "door release".
4. The input signal provided to the PLC shall be from the closure of a normally open dry contact.
5. Door release push buttons shall be by Telemecanique or approved equal.

2.10 MOTION DETECTOR

A. Description: Ceiling-mounted motion detectors to sense human motion for monitoring by VGUI system.

1. Motion sensors shall be resistant to false alarms due to temperature changes and shall be capable of covering an area 50' x 50' with optional lens for long range coverage. This unit shall also have horizontal and vertical pattern adjustment.
2. This unit shall also have the ability to enable and disable the external LED.
3. The alarm signal provided to the PLC shall be from the closure of a normally closed dry contact.
4. Motion sensors shall be by Square D or approved equal.

2.11 CABLES

A. Low-Voltage Control Cable: Multiple conductor, color-coded, No. 20 AWG copper, minimum.

B. Balanced Twisted-Pair Cable Comply with Section 271513 "Communications Copper Horizontal Cabling."

C. Optical Fiber Cables and Connectors: Comply with Section 271323 "Communications Optical Fiber Backbone Cabling."

2.12 ACCESSORIES

A. Interfaces with equipment specified in other Sections include accessories, adapters, electronic interface units, and connections required for functional performance indicated.

2.13 SOURCE QUALITY CONTROL

A. Prior to the shipment of the PLC and VGUI control systems to the project site, the ESSI shall provide a full system test of all security electronic control system equipment. All control system hardware head-end equipment shall be tested with the VGUI software and Security Management system. The ESSI shall make all necessary software modifications/corrections based on the results of the testing. The control systems shall be re-tested after the software modifications/corrections have been made.

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 monitoring and control system.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations of system connections before detention monitoring and control system installation.
2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of detention monitoring and control system.

B. Inspect built-in and cast-in anchor installations, before installing detention monitoring and control system, 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 requirements. Reinspect after repairs or replacements are made.
2. Perform additional inspections to determine compliance of replaced or additional anchor installations. Prepare inspection reports.

C. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 DELIVERY STORAGE AND HANDLING

A. Transport, handle, store, and protect materials under provisions of the General Conditions.

B. Transport materials in manufacturer's unopened original dry containers to avoid damage during shipment, with all tags and labels intact and legible, for timely installation. All enclosures,

equipment racks and cabinet back planes shall be shipped to site in packaging built by the ESSI specific to the enclosure, equipment racks and cabinets supplied to avoid damage during shipment.

3.3 SYSTEMS INTEGRATION

A. Integrate installations and connections of equipment and systems specified in this Section with those specified in the following Sections:

1. Section 08 7163 "Detention Door Hardware" for detention hardware controlled by detention monitoring and control system.
2. Section 2 75123 "Intercommunications and Program Systems" for intercommunication and paging equipment.
3. Section 28 4621.11 "Addressable Fire-Alarm Systems" and Section 284621.13 "Conventional Fire-Alarm Systems" for fire alarm equipment and devices.
4. Section 28 3121 "Area and Perimeter Intrusion Detection" for detection devices.
5. Section 28 2000 "Video Surveillance" for closed-circuit television equipment.
6. Section 32 3113 "Chain Link Fences and Gates" for gate operators and locking devices.

3.4 INSTALLATION

A. Comply with NECA 1.

B. Anchor equipment to building structural elements and support according to requirements in Section 26 0529 "Hangers and Supports for Electrical Systems."

C. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounted items.

D. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

F. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

G. Right of Way: Give to raceways and piping systems installed at a required slope.

H. Security Fasteners: Where accessible to inmates, install detention monitoring and control components using security fasteners with head style appropriate for fabrication requirements, strength, and finish of adjacent materials, except that a maximum of two different sets of tools shall be required to operate security fasteners for Project. Provide stainless steel security fasteners in stainless steel materials.

I. The ESSI shall be responsible for the demolition of unnecessary, existing security electronics head-end equipment and field devices and the installation and terminations of new security electronics.

J. The ESSI shall be responsible for the demolition of existing control station equipment and shall be responsible for the installation and terminations of all new control station equipment, including VGUI PCs, monitors and touchscreen master modules.

K. Where existing circuits are to be extended for connection to other equipment or systems, the ESSI shall break existing circuit at an accessible location, install terminal box with terminal strips or connectors and extend circuitry as required.

L. Where circuits are to remain to maintain operation to remaining devices, the ESSI shall verify continuity of circuits after removal of other equipment and/or devices. Where wire, cable and/or raceway modifications are required to maintain circuits, the ESSI shall provide such modification as part of the work.

M. During the project, any existing, non-functioning equipment and/or field devices shall be documented by the ESSI in a report and provided to the Owner prior to substantial completion. During the review of the report by the Owner, the Owner shall decide as to what action should be taken concerning the non-functioning equipment. The Owner shall have the option of requesting a price from the ESSI to repair and/or replace defective equipment.

N. The Owner shall be responsible for providing a high-speed internet connection to the Security Management Server for remote diagnostics by the ESSI.

O. The ESSI shall remove all existing operator control stations and ancillary equipment and turn over to the Owner for their disposal.

P. The new video management system shall be integrated with the PLC system and VGUI software to allow automatic (connecting intercom stations or alarm activities) or manual call-up of any camera connected to the system. The ESSI shall provide a dedicated network interface card for each server to connect to the PLC/touchscreen system network.

Q. The ESSI shall provide for the demolition of the existing door control system equipment.

R. The ESSI shall re-use the existing door control relays, fuse holders, fuses and power supplies.

S. The ESSI shall provide and install a PLC System as specified herein. The system shall include all equipment, installation materials, set up, and testing to form a complete operating system. Independent system functions and integrated system functions to be fully verified as part of system testing and commissioning.

T. The ESSI shall provide all new PLC equipment consisting of a new PLC processor, chassis, power supply, communication module, input modules and output modules. The PLC processor shall include a non-volatile memory card to store the program and protect against power and battery failures.

U. All PLC input and output modules shall be distributed and interconnected utilizing an Ethernet/IP communications network.

V. The ESSI shall verify quantities and provide all necessary equipment and labor in their bid proposal to provide control and monitoring of all existing devices currently controlled and monitored by the existing security electronics control system.

3.5 WIRING

A. All wiring for electronic equipment under this section shall be in conduit from the device to the SECs and racks in detention control equipment room. Conduit shall be Electrical Metallic Tubing (EMT). If exposed conduit is deemed necessary, and its use is approved by the A/E, it shall be installed in Rigid Steel Conduit (RSC) tight against a solid surface (i.e., wall and ceiling) in a manner approved in advance by the A/E.

B. The listing below describes conduit and raceway requirements. The Division 26 electrical contractor shall assume, for bidding purposes, that each security device will require an individual homerun, however, if he can determine that like devices can be routed in the same conduit, he may provide a conduit and wiring system that accomplishes that. All conduits shall be filled with the maximum 40% fill definition that is indicated in the National Electric Code (NEC). Each system shall have an independent conduit system as follows:

1. Door control and monitoring – conduit group 1
2. Intercom and paging system – conduit group 2
3. CCTV cameras and monitors – conduit group 3
4. Operator station touch screen – conduit group 4
5. Intercom master stations – conduit group 5
6. CCTV keyboards – conduit group 6
7. Visitation handsets – conduit group 7

C. All other conduit sets, including those for auxiliary system control, are the responsibility of the electrical contractor.

3.6 GROUNDING

A. AC Power and Lighting Circuits: Comply with Section 260526 "Grounding and Bonding for Electrical Systems" for materials and installation requirements.

B. Class 2 Power - Limited Power, Signal, and Control Circuits: Ground systems and equipment according to manufacturer's written instructions.

3.7 INSTALLATION OF WIRES AND CABLES

A. Low-Voltage Analog Circuits: Install wiring as specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Balanced Twisted-Pair Cabling: Install as specified in Section 271513 "Communications Copper Horizontal Cabling."

C. Optical Fiber Cable: Balanced Twisted-Pair Cabling: Install as specified in Section 271323 "Communications Optical Fiber Backbone Cabling."

D. Bundle, train, and support wire and cable in enclosures.

E. Connections: Make connections according to manufacturer's wiring diagrams, unless otherwise indicated.

F. Wiring Method: Install wire and cable in metal raceway except where another wiring method is indicated.

3.8 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 0544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.9 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Comply with requirements in division 07 section regarding firestopping.

3.10 IDENTIFICATION

A. Identify electrical components and power wiring according to Section 260553 "Identification for Electrical Systems."

B. Identify communications components and control wiring according to Section 270553 "Identification for Communications Systems."

C. Label each monitoring and control module and equipment unit with a unique designation that is consistent with wiring diagrams and schedules in operation and maintenance manual. Label conductors and cables at each end and where exposed within troughs and pull-and-junction boxes.

3.11 FIELD QUALITY CONTROL

A. ESSI shall perform the following tests and inspections:

1. Schedule visual and mechanical inspections and electrical tests with at least seven days' advance notice.
2. Inspect detention monitoring and control components for defects and physical damage, labeling of testing laboratory, and nameplate compliance with the Contract Documents.
3. Inspect interiors of enclosures, including the following:

    a. Integrity of mechanical and electrical connections.
    b. Component type and labeling verification.
    c. Ratings of installed components.

4. Electrical Tests: Use caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:

    a. Continuity tests of circuits.
    b. Operational Tests: Set and operate controls at each control panel and at each monitored and controlled device to demonstrate their functions and capabilities. Use a methodical sequence that cues and reproduces actual operating functions as recommended by manufacturer. Record response to each test command and operation, including logging and printout of events. Record time intervals between initiation of alarm conditions and registration of alarms at control (panel), and between initiation of commands and execution at controlled equipment.

1) Coordinate testing required by this Section with that required by Sections specifying equipment being monitored and controlled and systems to be integrated with detention monitoring and control work.
2) Simulate malfunctions to verify protective features and appropriate alarm indications.

5. Seismic-restraint tests and inspections shall include the following:

a. Type, size, quantity, arrangement, and proper installation of mounting or anchorage devices.
b. Test mounting and anchorage devices according to requirements in Section 27 0548.16 "Seismic Controls for Communications Systems."

6. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.
7. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.
8. Record of Tests and Inspections: Maintain and submit documentation of tests and inspections, including references to manufacturers' written instructions and other test and inspection criteria. Include results of tests, retests, and inspections. Include printout of testing event log, annotated to provide a machine record of testing that corresponds to written test records.

B. Prepare test and inspection reports.

3.12 DEMONSTRATION

A. ESSI shall train Owner's staff personnel to adjust, operate, and maintain systems.

B. Provide training covering features, capabilities, and operation of installed control panels. Show cause-and-effect sequences during operation. Cross-reference instruction manuals throughout. Follow same order of presentation as instruction manual. Include the following:

1. Control Panel Operation:

a. Describe and demonstrate indications, controls, and features.
b. Demonstrate responses to all indications, call-ins, and emergencies.
c. Demonstrate setup of control panels and related equipment.
d. Describe and demonstrate safety and security precautions.
e. Show how to get help.

2. System and Equipment Maintenance:

a. Describe and demonstrate safety and security precautions.
b. Demonstrate basic maintenance; need for qualified technician for internal maintenance; basic maintenance schedule; techniques for keeping terminals properly tightened, filter screens clean, and overheat sensors checked; and techniques for performing other required servicing.
c. Demonstrate adjustment of controls. Describe warranty and show how to get help.

3. System Troubleshooting:

a. Demonstrate troubleshooting procedure for common software, programming, control panel, communications, and field device problems.

END OF SECTION

SECTION 28 5213

DETENTION MONITORING AND CONTROL SYSTEMS

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the security drawings:

1) Electrical equipment coordination and installation.
2) Common electrical installation requirements.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the security drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the security drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. 28 0500 – Common Work Results for Detention Security
2. 28 2000 – Video Surveillance
3. 28 5200 – Security Intercommunication System
4. 28 5211 - Detention Monitoring and Control Systems Hardware
5. 28 5213 - Detention Monitoring and Control Systems Software
6. 28 5215 - Auxiliary Systems Control
7. <**List sections that require direct coordination with this section**>

B. Installed but furnished by others:

1. Related Divisions 08 Sections:

a. Prepare doors and frames for electrified hardware and devices specified in this section
b. Coordinate templates and preparation of doors and frames for electrified hardware.
c. Coordinate hardware with the requirements of this section.

2. Related Division 11 Sections:

    a. Coordinate templates and preparation of doors and frames for electrified hardware.
    b. Coordinate power requirements for electric hardware with the requirements of this section.
    c. Prepare doors and frames for electrified hardware and devices specified in this section.

3. 26 0519 - Low-Voltage Electrical Power Conductors and Cables
4. 26 0526 - Grounding and Bonding for Electrical Systems
5. 26 0533 - Raceways and Boxes for Electrical Systems
6. 26 0529 - Hangers and Supports for Electrical Systems
7. 26 5119 - LED Interior Lighting
8. <**List items that may be furnished by others, but installed by this contractor**>

1.3 SUMMARY

A. System Description

1. The Electronic Security System Integrator (ESSI) shall be responsible for providing a complete electronic security system. The security automation system shall be comprised of one or more programmable controllers, communications networks and operator interfaces. This system shall provide the necessary remote I/O, power supplies, input modules, output modules and any other required equipment to provide a fully functional system. The system will receive discrete inputs, and through the use of an internal control logic program, control output relay operations and perform remote control functions via the Video Graphic User Interfaces (VGUI).
2. The detention monitoring and control system shall control all electrically operated door hardware, monitor all doors, bolt position limit switches, and annunciation of all door status and alarms upon violation. Intercoms, paging, duress, card access, and video surveillance control shall be integrated into the security systems as well as fire emergency release provisions for the holding areas.
3. Control of the system shall be via video graphic user interfaces (VGUI) and graphic control panels located as per the drawings.
4. All detention monitoring and control system's actions shall be recorded onto a Security Management Server (SMS) database.
5. The ESSI shall provide all labor, equipment, materials and supervision to install, program, calibrate, adjust, document, and test the total system as required herein, as shown on the drawings and required for the complete integration of the security system.

B. Section Includes:

1. VGUI operational description.
2. SMS operational description.
3. VGUI and SMS software.

1.4 DEFINITIONS

A. I/O: Input/output.

B. LAN: Local Area Network.

C. LED: Light-emitting diode.

D. Monitoring: Acquisition, processing, communication, and display of system and equipment status data and event and alarm signals.

E. MOV: Metal-oxide varistor.

F. Nonsecure: Closed and locked and with no unlock or open commands pending. (For doors and gates.)

G. PLC: Programmable logic controller.

H. Secure: Unlocked or open. (For doors and gates.)

I. Systems Integration: The bringing together of components of several systems containing interacting components to achieve indicated functional operation of combined systems.

J. Zone: A space or area defined on Drawings for a specific purpose.

1.5 ACTION SUBMITTALS

A. VGUI Station Displays

1. Submit the layout and operational description of all VGUI interfaces in digital form (.pdf). Submission shall indicate all device icons and operations.
2. It is mandatory that the ESSI provide a minimum of two on-site scheduled meetings with the owner's representatives for review of the VGUI design layout and performance. VGUI system shall perform all operations required by the owner’s representatives as to how they relate to the equipment specified and shown on the plans.
3. Include a software data flow diagram/chart indicating in what programs and where all control logic will reside. Provide a detailed description of software approach Provide color .pdf file of each proposed video graphic control screen.

1.6 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Submit certification that fabrication for completed equipment rack and control panel assemblies will withstand seismic forces defined in Section 27 0548.16 "Seismic Controls for Communications Systems." Include the following:

1. Description of features included in equipment and equipment assemblies to withstand anticipated acceleration loads.
2. Basis for Certification: Indicate whether withstand 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."

3. Dimensioned Outline Drawings of Equipment Racks and Control Panels: Identify center of gravity of fully equipped and assembled units and locate and describe mounting and anchorage provisions.

4. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Qualification Data: For Installer and Detention Electronic Systems Integrator.

C. Field quality-control reports.

D. Program documentation, software licenses, and backup copies of software used on Project.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For detention monitoring and control equipment components to include in emergency, operation, and maintenance manuals.

B. Furnish as-built drawings in .pdf format or in format approved by Architect on compact disk or other media approved by the Architect

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by detention door control manufacturer and detention monitoring and control equipment manufacturer and with detention facility construction and systems integration experience with the following electronic systems:

1. Fire alarm.
2. Intercommunications.
3. Paging.
4. Remote lighting and power controls.
5. Video surveillance.

PART 2 - PRODUCTS

2.1 VGUI OPERATIONAL PERFORMANCE

A. System Response Time: For indicated items, shall be within the following limits:

1. Mechanical Locking and Unlocking of Doors: Within one second of operator action at control panel.
2. Initiate Mechanical Movement of Electrically Controlled Doors and Gates: Within one second of operator action at control panel.
3. Initiate Audible and Visual Indications at Control Panels: Within one second of change of state of monitored field devices, or of alarm or intercom call-in events.
4. Initiate Automatic Switching [**and Start of Automatic Countdown Cycles**]: Within one second of occurrence of specified triggering event.

B. General Functional Performance:

1. Video display shall be connected so an operator can interact with and control the computer, responding to inputs and creating outputs that control external functions.
2. Data from external sensors and signal sources shall be processed by external I/O units, PLCs, and the computer, and initiate displays of system and equipment status, activity, and other information on the monitor and through related signal devices. Where

indicated, data from external sensors and signal sources also initiate automatic system responses.

3. Software correlates various points on the touch-sensitive panel with software-generated graphics so operational outputs are created by touching the screen at locations defined by the graphics.
4. Touch-panel outputs shall be processed by computer and by integrated external I/O modules and PLCs to produce control signals and operating voltages for switching devices and relays that control those devices.
5. Computer software shall provide pop-up and tool-bar-type menus and special icons that guide the operator in responding to events and in switching to different screen displays to obtain access to different control panel functions.

C. Detailed Operational Performance: Include the following control, monitoring, and performance functions by the VGUI and associated equipment and circuits:

1. Global Functions: Touching the icons or toolbar buttons at the bottom of each graphic screen, and elsewhere as indicated, controls the following functions:

a. Operator Log-On and Log-Off: Dialog box appears for password entry.

1) Logging Off: Dialog box prompts operator to verify intent to log off, and to either exit the process or complete it.
2) Completion of log-off process displays log-on screen for the next operator to access touchscreen functions.

b. Map Finder: Graphic map index appears with provision for the operator to select a map and its associated functions to be displayed.
c. Clean Screen: All icons and graphics are extinguished for 15 seconds to facilitate physical cleaning of control panel screen surface.
d. System Utilities: System management screen appears, presenting functional choices appropriate for the logged-on operator's programmed access level; choices inappropriate for the operator appear in dialog box but are grayed out to indicate they are inactive. Choices include the following:

1) Configure station users.
2) Change password.
3) Calibrate touchscreen.
4) Set date and time.

e. Scroll to Adjacent Area: Four icons, one on each side of the screen, near the edge. Touching these icons selects the screen for adjacent area on that side of area currently displayed.

2. Audible and Visual Alarm Indications and Controls: Red alarm icon flashes and a distinctive tone pulses continuously at control panel when an alarm condition or uncontrolled change of state occurs in controlled or monitored circuits or equipment.

a. Tone is silenced by momentary-contact silence control icon, and status icon becomes steady.
b. Depressing the momentary-contact reset control icon extinguishes status icon for alarms that can be reset at control panel.

3. Door Status Visual Indications: Denoted by status icon at door control icon as follows:

a. Nonsecure: Red icon.

b. Secure: Green icon.
c. Alarm (Door Position or Lock Status Inconsistent with Control Position or Status): Flashing red icon.

4. Panel-Controlled, Unlocking and Automatic-Locking, Single Swing Doors: Operation of control icon unlocks door for a period programmable from 1/2 to 10 seconds.
5. Power-Operated Door or Gate with Open, Stop, and Close Control: Operation of open control icon applies power, initiating open cycle. Touching the stop control icon while mechanism is in open or close cycle stops motion. Touching the close control icon applies power, initiating close cycle. Limit switch in mechanism stops unit at end of its travel in either direction.
6. Doors with Both Individual and Group Control:

    a. Touching the individual door control icon locks or unlocks door, depending on current status.
    b. Touching the group control icon locks or unlocks doors assigned for group operation, depending on current group control enablement status of individual doors.
    c. Doors are individually enabled for group locking and unlocking using separate group assign and unassign control icon.

7. Assign and Unassign Group-Door Function:

    a. Touching the group door assign and unassign control icon lights that icon and a red status icon at each door that is currently assigned for group operation, and permits unassigning any of those doors by touching the associated lock and unlock control icon.
    b. Doors not currently assigned are assigned for group operation by touching the associated lock and unlock control icon while group assign and unassign control icon continues to be lighted.
    c. Touching the group door assign and unassign control icon again returns system to normal operating mode.

8. Group Door Control, Locking and Unlocking: Touching the group lock and unlock control icon locks doors in group if they are currently unlocked. If doors are locked, action presents a dialog box requiring operator confirmation before unlocking doors assigned to group.

    a. Locking or unlocking of doors is performed individually at one-second intervals.

9. Door Interlocking: Interlocks designated groups of doors and gates.

    a. Effect: When one door in a group is unlocked or open, the others in the group are prevented from being unlocked or opened.
    b. Override When One Door of an Interlocked Group Is Nonsecure: Touching the interlock override control icon presents a dialog box requiring operator confirmation before placing nonsecure interlocked door group in an override mode.

        1) Override mode permits doors in group to be unlocked and opened for a time interval of programmable duration, set at 10 seconds.

    c. Interlocked Door Indications: The following status indications apply to interlocked doors in addition to specified indications for controlled doors:

1) Door status icons for secure doors light steadily yellow when one door in group is nonsecure; icons flash yellow when group is in override mode.
2) When two or more doors in group are nonsecure, status icons for doors in group flash red; tone pulses; touching the silence control icon silences tone.

10. Operator-Controlled, Emergency Door Release: Operation of emergency-release control icon presents a dialog box requiring operator confirmation before unlocking designated doors. Doors remain unlocked until relocked individually or in groups.

    a. Next operation of icon locks door.
    b. Locking or unlocking of doors is performed individually at one-second intervals.
    c. Indications: Red status icon at emergency-release control icon is lighted and sounds a distinctive tone.

        1) When emergency-release control icon unlocks doors, status icon flashes continuously five times per second and audible alarm pulses.
        2) Touching the silence control icon silences audible alarm.
        3) When doors are relocked or alarm-reset control icon is touched, status icon is extinguished and alarm is silenced.

11. Intercommunication Control:

    a. Incoming Intercom Call: When staff or inmate station initiates a call to control panel station, a distinctive tone sounds and green icon at station control icon flashes.
    b. Operator acknowledges call by touching the intercom control icon associated with calling station or the acknowledge control icon. Status icon is lighted steadily and tone ceases.
    c. Acknowledgment of the call opens an audio path to calling station and permits operator to conduct two-way conversation using push-to-talk switch and microphone.
    d. Operating the control icon again, or selecting another station, terminates the connection and the status icon at first station is extinguished.
    e. Listening or Outgoing-Call Function: Operator selects staff or inmate station by operating the station select control icon. Operator may listen or proceed with two-way conversation using push-to-talk switch and microphone. Selecting station again, or selecting another station, terminates the connection.

12. Paging: Operator transmits paging announcements by touching a momentary-contact paging control icon, closing a momentary push-to-talk switch, and using microphone. Green status icon lights at paging control icon until it is operated again to terminate the connection. Multiple zones may be paged simultaneously by operating more than one paging zone control icon before transmitting.
13. Audio-Level Alarm: Touching the audio-level-alarm control icon shall place intercom system in monitoring mode for cell noise level.

    a. Red icon at audio-level-alarm control icon is lighted when system is in alarm mode.
    b. When in alarm mode, system alarms when noise level in any cell exceeds an adjustable preset threshold. Green icon flashes at control panel intercom station control icon for the cell originating the alarm, and audible alarm tone pulses.
    c. Touching the silence control icon silences audible alarm and causes green icon to light steadily.
    d. When reset control icon is operated, the green status icon is extinguished.

14. Video Switching Control:

a. Signal from assigned camera is automatically shown on monitor when the following occurs:

1) Operator selects associated intercommunication station by operating the selector control icon for the station, by acknowledging incoming intercom call, or by touching the camera control icon.
2) A staff-duress signal is initiated in the vicinity of camera.

b. Video signal from assigned camera is manually switched to spot monitor at control station when operator touches camera control icon.
c. Green status icon on the graphic control panel identifies and locates the video camera currently providing the signal for spot monitor at control panel location.
d. The orientation of the camera symbol shall be representative of the actual direction of the camera.
e. Two onscreen video display windows shall be incorporated into the GUI. One window shall be used for manual camera call-up and the other window shall be used for intercom follow. Selecting another camera icon shall cause its camera to become active and cancel the previous camera.

15. Cell Lighting Control: Two control icons for each cell provide on-off and inmate control for lights[**and receptacles**] in each cell.

a. Touching the inmate control icon energizes receptacles and enables or disables local control of lighting within cell, depending on current status.
b. Touching the on-off control icon turns lights and receptacles on or off, depending on current condition.
c. Indications: [**Green**] [**Orange**] icon at on-off control icon is lighted when [**lighting is**] [**lighting and power are**] on; otherwise, icon is not lighted. [**Green**] [**Orange**] icon at inmate control icon is lighted when inmate control is enabled.

16. Electrical Circuit On-Off Switching Control: A control icon for each function toggles between on and off to energize and de-energize circuits.

a. Indications: [**Green**] [**Orange**] icon at control icon indicates when lighting or power is on.

17. Fire Alarm System Status Indications:

a. Red fire alarm icon flashes when alarm occurs.
b. Red icon for each zone flashes when alarm occurs for that zone.
c. Red icon for each detection device and each manual station flashes when that device or station is in an alarm state.
d. Audible alarm tone pulses when alarm signal occurs.
e. Depressing the silence control icon silences audible tone and causes status icon to light steadily. After fire alarm system is reset, touching the reset control icon extinguishes status icon.

18. Smoke Control: Touching the smoke control icon initiates a signal to HVAC system controls to start preestablished smoke-control operating mode. Yellow status icon flashes continuously to confirm HVAC system is operating in smoke-control mode.
19. Duress-Status Indications: When staff-duress device for a zone is activated, red staff-duress status icon for that zone flashes and audible alarm tone pulses. Operating the silence control icon silences audible alarm and causes status icon to light steadily. Operating the reset control icon extinguishes status icon.
20. Elevator Security Controls: <**Insert description of functions to be provided.**>

21. Water-Flow Control: On-off control icon at control panel for designated [**showers**] [**fixtures**] [**showers and fixtures**].

    a. Touching the water-on control icon opens solenoid valve in supply line. Touching the control icon again closes valve.
    b. Indications: Yellow icon is lighted when water is on; otherwise, icon is not lighted.

22. Panel Control-Power Switch: Key-operated switch turns power to control panel on and off and enables operation.

    a. Indications: Green power-on status icon is lighted when panel is enabled; otherwise, icon is not lighted.

23. Emergency Features

    a. Located on GUI menu shall be a button labeled “EMERGENCY.” Pressing this button will display the Emergency Menu which consists of various emergency related function buttons. These buttons shall include: RELEASE ALL, and LOCKDOWN.

        1) RELEASE ALL button:

            a) When pressed, this button shall begin the Emergency Evacuation sequence and display a window explaining the risk of the action. The GUI shall also audibly warn the operator of the risks involved in continuing the action. On the step 1, window there shall be buttons to CONTINUE and ABORT.
            b) If the operator continues, the first window shall disappear and a second window shall again warn of the danger and risks involved in continuing. Also the GUI shall place “E” symbols on all controlled doors that will be released and again warn the operator of the dangers involved in continuing. On the step 2 window, there shall be buttons to CONTINUE and ABORT.
            c) If the operator chooses to continue, a full screen window shall appear stating that this is the final warning before release. An audible message shall warn the operator that after this step, all doors with “E” symbols will be released. On the step 3 window, there shall be a button to CONTINUE and the ABORT button should at least 10 times larger in size.
            d) Pressing continue will begin the unlocking sequence, all doors with “E” symbols will be released or opened.

        2) LOCKDOWN button: The Emergency Window shall contain a LOCKDOWN button. This button shall lock all held-open swing doors as well as close all sliding and overhead doors

24. Additional Features

    a. NAVIGATION PANE – There shall be a portion of the GUI screen dedicated to screen navigation for the Security Automation System. This shall be a graphical representation of the floor layout segmented to represent each screen. This area is also used to display Door Violation Indication, Alarm indication and Pending Intercom indication. When a door on particular screen violates the screen associated with that door flashes red indicating to the operator that their attention is required. Other devices that should be indicated by a red flash in the Navigation Pane include: Fire Alarm System Annunciation. Pending Intercom stations shall

flash their respective windows green to help assist the operator in finding the pending station. The current active screen shall be displayed as white allowing the user to see their current location

b. ALARM ACKNOWLEDGE - Selecting this icon shall acknowledge and silence the audible notification used to indicate a violated door, intercom station call, or any other alarm.

c. CONTROL ROOM DURESS - Selecting this icon shall immediately DISABLE all functions of the GUI.

d. ADMINISTRATIVE UTILITIES MENU - Located on the menu shall be a button for configuring convenience and maintenance options to the operator.

1) A 'COMMAND FUNCTIONS' button shall allow the operator to shut-down the GUI software applications. Upon selecting the button, the operator is prompted to provide an administrator-level password before the software applications are shut down.

2) A 'VOICE STYLE' selection shall allow the operator to select between a female, male, or basic for common GUI functions. For audible alarm indications, the GUI shall play a male or female voice always.

3) A 'CALIBRATE SCREEN' button shall allow the operator to calibrate the GUI overlay for proper touch alignment.

4) A 'CLEAN SCREEN' button shall allow the operator to clean the surface of the GUI display with a manufacturer approved cleaning product. The screen shall be "blanked" so that no icons or control functions are available to the operator. An onscreen message shall tell the user what types of cleaning products are approved.

2.2 SMS OPERATIONAL PERFORMANCE

A. Automatic Logging of System Events: To a Security Management System (SMS).

1. All events that take place within the PLC and Electronic Security System shall be logged to the SMS provided by the ESSI. The HMI software installed on the GUI stations shall not be dependent on the SMS and its software. The loss of functionality of the SMS shall in no way affect the normal operation of the GUI software.

B. The SMS shall have the following features:

1. Record Device Events for the following field devices:

a. Doors
b. Intercoms
c. Cameras
d. Utility Control (Lighting, Receptacle)
e. Misc. Alarms
f. Any other project-specific device

2. Record Control Point events for each GUI station. These events shall be visibly different from Device Events and display which control point and which user initiated the event. A control point shall consist of events generated by a GUI station. Control Point events shall include the following events;

a. Touchscreen Status
b. Interlock Override
c. Emergency Evacuation

3. The software shall allow the user to enter a credential, or 4-digit pin for each GUI station.
4. Event log shall be stored in a SQL database and be archived for retrieval.
5. The SMS shall provide the user the ability to display the previous 100, 50 or 25 events dynamically updating on the screen.
6. The SMS shall provide the user the ability to adjust the refresh rate for the events at a rate of 10 seconds, 30 seconds, 60 seconds or 5 minutes.
7. The user shall be able to filter the dynamic event display by device type.
8. The dynamic event display shall display columns for Control Point/User, Recorded Audio File, Timestamp (the date and time of the event), Device Name, Event Type, Device Description/Note, Device Type, Area Name (location area name the specific device is grouped in).
9. The user shall be able to generate reports based on database queries for event names or time of occurrences. This report shall be displayed on screen and the user should be allowed to print the report.
10. Devices and their associated events shall have the ability to be grouped based on their respective locations in the building. (i.e. Cell Block A, B, C, Booking, etc)
11. The user shall have the ability of performing a search function that looks for keywords such as type of event, area of the building, or device names. The search function will replace the dynamic event view with the returned list based on the search criteria. The user can either choose to see the previous 100 events (based on the search criteria) or all events containing the keyword(s) searched.
12. Provide e-mail notification that includes the following functionality:

    a. Manage rule definitions, that when evaluated as true, will send an e-mail.
    b. Each rule can be based on any combination of LT Timestamp, Device Name, Event Name, Device Description, Device Type Name, Area Name, Control Point Name, Username, URL, and Note.
    c. Rule start time and end time can be defined.
    d. Rules can have custom messages attached to email alert.
    e. Each rule can be based on device or control point events.
    f. Each rule can be associated with one or more email addresses.
    g. Each email can be associated with one or more rules.
    h. System shall have the ability to send notification emails to a defined email server via SMTP.
    i. System shall log notification events and the operator shall be able to view them through the Monitor client application.

13. Provide an audio playback feature that includes the following functionality:

    a. Each active audio connection (conversation) between an intercom station and a GUI station shall be recorded to the Security Management System (SMS) as a single MP3 audio file.
    b. In the dynamic event display, there shall be a column for a recorded audio conversation. If an audio file is associated with the intercom connect event, the system shall display a speaker symbol.
    c. If the speaker icon is selected, a “Play Audio” menu shall be displayed. On the menu screen, the Device Name, the Event Timestamp and the Control Point Name/User shall be displayed.
    d. The Play Audio menu shall allow the user the choice of ESSI ng “PLAY” to play back the audio file directly on the server, ESSI ng “STOP” to stop the playback, or ESSI ng “EXPORT AUDIO” to export the audio file to a location on the server selected by the user.
    e. Along with the “PLAY” and “STOP” buttons, the Total Duration of the sound file shall be displayed. The Current Position (dynamically displayed) and Current

Ending location of the sound file shall also be displayed. All times shall be displayed in minutes and seconds.

f. The Play Audio menu shall include a progress bar that visually indicates where in the recorded audio file the playback is currently at. There shall be two adjustable markers (“start” and “end”) to allow the user the option of customizing where they want the audio to start and stop playing.

g. Provide sufficient hard drive space on the data logging server to store 1000 hours of audio files to the Security Management System (SMS) hard drive(s).

2.3 VGUI AND SMS VIDEO CONTROL SOFTWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Indusoftt.
2. Intouch.

B. Description: Custom developed from a detention application package.

1. The software shall be a commercial SCADA (Supervisory Control and Data Acquisition) system that is distributed worldwide for such automation systems. The manufacturer shall have produced a line of SCADA software for at least ten years and currently provides Internet support of its products including on-line updates and technical support.
2. All software shall be licensed (registered) to the owner.
3. The software shall operate on the Microsoft Windows 10 professional platform and exhibit strong compliance with Microsoft's Windows Open Systems Architecture (WOSA) standards. The system must support running as a service under Windows 10 PROFESSIONAL.
4. All configuration changes shall be capable of being made on-line, while the system is operating.
5. The system shall provide complete user documentation in an electronic format and on-line "help" based upon Windows standard Hypertext. Both shall provide context-sensitive information on the use of the package.

C. Features and Functional Performance Requirements:

1. Programmed to provide features and functional performance indicated without use of proprietary software code.
2. Automatic alignment and adjustment of touchscreen interface with video monitor and its graphics.
3. Visual and Audible Presentations: Designed for simplicity and rapid operator orientation, and conducive to operator focus on the highest-priority mission functions assigned to operator and station.
4. Maps: Facility floor and site plans presented in selectable, scaled, on-screen, part-plan increments with the following content:

a. Basic architectural elements depicted with white lines on a black background.

b. Floor plan features for which control icons or status indicators are specified, including doors, gates, intercom stations, paging speakers, video cameras, duress stations, fire alarm stations, smoke detectors, and similar items.

c. Egress paths.

d. Control icons represent switches for specified control functions, operating through integration with the touchscreen interface.

e. Indicator icons show status of related feature by changing from nonlighted to lighted, by flashing, and by changing color.

5. Priority Level Implementation: For processing and registering alarms, device signals, and intercom activity in the following order:

    a. Fire and other life-safety alarms.
    b. Staff-duress alarms.
    c. Inmate sound-level monitoring alarms.
    d. Door-monitoring and perimeter-security alarms and trouble signals.
    e. Intercom calls from other master stations.
    f. Intercom calls from access and inmate-movement control stations.
    g. Intercom calls from cells.
    h. System and equipment derangement and trouble alarms.

6. Access Protection: Log-on passwords provide 8 levels of security for access to various functional capabilities provided at each touchscreen station. System shall support 1000 users.

    a. Configures, generates, and prints reports, using automatically logged event data.
    b. Edits and updates programs, databases, system operating variables, point descriptions, help and operating protocol screens, and icon designations.
    c. Operator Assistance Material: Provides interactive help messages and other material, including the following:

        1) Descriptions of functions initiated by control icons and menu items.
        2) Explanations of conditions denoted by audible and visual indications.
        3) Instructions for performing control process.
        4) Synopses of policies governing control panel operation and standard operating procedures.

7. Audible Tones: Multiple computer-generated tones that can be programmed for frequency, volume, duration, and repetition rate and selected for each audio annunciation application.

2.4 SOURCE QUALITY CONTROL

A. Prior to the shipment of the PLC and GUI control systems to the project site, the ESSI shall provide a full system test of all security electronic control system equipment. All control system hardware head-end equipment shall be tested with the GUI software and Security Management system. The ESSI shall make all necessary software modifications/corrections based on the results of the testing. The control systems shall be re-tested after the software modifications/corrections have been made.

PART 3 - EXECUTION

3.1 GENERAL

A. The GUI software shall be programmed and configured to provide all functionality as described in this specification section. The GUI software shall communicate with all required security system components to display, control and monitor all security devices as specified.

B. The new video management system shall be integrated with the PLC system and GUI software to allow automatic (connecting intercom stations or alarm activities) or manual call-up of any

camera connected to the system. The ESSI shall provide a dedicated network interface card for each server to connect to the PLC/touchscreen system network.

C. VGUI Review Meetings with Owner

1. The ESSI shall coordinate the control and monitoring configuration of each GUI station in the system with the Owner. Areas of control and monitoring shall be logically configured for each GUI station while considering the security envelope and concerns of each area of control. This owner coordination shall occur over two meeting:

a. Meeting Number One (On-Site) within 45 days after award of the contract.

1) Review and refine initial submittal. A/E will return initial submittal comments to the ESSI.
2) Review and refine video graphic displays, operation of functional icons, and general functionality of the electronic security system. Provide six (6) copies of the proposed video graphic control screens. Demonstrate functionality on computer.

b. Meeting Number Two (On-Site) within 90 days after award of the contract.

1) Review and refine re-submittal. A/E will return re-submittal comments to the ESSI.
2) Review and refine video graphic displays, operation of functional icons, and general functionality of the electronic security system. Provide six (6) copies of the proposed video graphic control screens. Demonstrate functionality on computer.

3.2 SYSTEMS INTEGRATION

A. Integrate installations and connections of equipment and systems specified in this Section with those specified in the following Sections:

1. Section 08 7163 "Detention Door Hardware" for detention hardware controlled by detention monitoring and control system.
2. Section 2 75123 "Intercommunications and Program Systems" for intercommunication and paging equipment.
3. Section 28 4621.11 "Addressable Fire-Alarm Systems" and Section 284621.13 "Conventional Fire-Alarm Systems" for fire alarm equipment and devices.
4. Section 28 3121 "Area and Perimeter Intrusion Detection" for detection devices.
5. Section 28 2000 "Video Surveillance" for closed-circuit television equipment.
6. Section 32 3113 "Chain Link Fences and Gates" for gate operators and locking devices.

3.3 FIELD QUALITY CONTROL

A. The ESSI shall provide a full system test of all security electronic control system equipment. All control system hardware head-end equipment shall be tested with the VGUI software and SMS. The ESSI shall make all necessary software modifications/corrections based on the results of the testing. The control systems shall be re-tested after the software modifications/corrections have been made.

3.4 DEMONSTRATION

A. ESSI shall train Owner's staff personnel to adjust, operate, and maintain systems.

B. Provide training covering features, capabilities, and operation of installed control panels. Show cause-and-effect sequences during operation. Cross-reference instruction manuals throughout. Follow same order of presentation as instruction manual. Include the following:

1. Control Panel Operation:

    a. Describe and demonstrate indications, controls, and features.
    b. Demonstrate responses to all indications, call-ins, and emergencies.
    c. Demonstrate setup of control panels and related equipment.
    d. Describe and demonstrate safety and security precautions.
    e. Show how to get help.

2. System and Equipment Maintenance:

    a. Describe and demonstrate safety and security precautions.
    b. Demonstrate basic maintenance; need for qualified technician for internal maintenance; basic maintenance schedule; techniques for keeping terminals properly tightened, filter screens clean, and overheat sensors checked; and techniques for performing other required servicing.
    c. Demonstrate adjustment of controls. Describe warranty and show how to get help.

3. System Troubleshooting:

    a. Demonstrate troubleshooting procedure for common software, programming, control panel, communications, and field device problems.

END OF SECTION

SECTION 28 5215

AUXILIARY SYSTEMS CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Contractor

a. All work related to the furnishing, installing, and testing of the following material described within this specification as outlined on the security drawings:

1) Electrical equipment coordination and installation.
2) Common electrical installation requirements.

B. Alternate Bids:

1. Contractor

a. Alternate Bid No. 1

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with enclosing portions of outdoor courtyard and creating outdoor exercise spaces 160 and 161 as noted on the security drawings.

b. Alternate Bid No. 2

1) All work related to the furnishing, installing, and testing of all material described within this specification associated with converting existing outdoor exercise spaces (Rooms 157 and 159) into indoor exercise spaces as noted on the security drawings.

1.2 RELATED WORK

A. Specified elsewhere:

1. 28 2000 – Video Surveillance
2. 28 5200 – Security Intercommunication System
3. 28 5211 - Detention Monitoring and Control Systems Hardware
4. 28 5213 - Detention Monitoring and Control Systems Software
5. 28 5215 - Auxiliary Systems Control
6. <**List sections that require direct coordination with this section**>

B. Installed but furnished by others:

1. Related Divisions 08 Sections:

a. Prepare doors and frames for electrified hardware and devices specified in this section
b. Coordinate templates and preparation of doors and frames for electrified hardware.
c. Coordinate hardware with the requirements of this section.

2. Related Division 11 Sections:

a. Coordinate templates and preparation of doors and frames for electrified hardware.
b. Coordinate power requirements for electric hardware with the requirements of this section.
c. Prepare doors and frames for electrified hardware and devices specified in this section.

3. 26 0519 - Low-Voltage Electrical Power Conductors and Cables
4. 26 0526 - Grounding and Bonding for Electrical Systems
5. 26 0533 - Raceways and Boxes for Electrical Systems
6. 26 0529 - Hangers and Supports for Electrical Systems
7. 26 5119 - LED Interior Lighting
8. <**List items that may be furnished by others, but installed by this contractor**>

1.3 SUMMARY

A. System Description:

1. This section includes the requirements and operational characteristics for an Auxiliary Control System, which is an integral part of the Security Automation System.
2. Auxiliary control system features included are:

a. Remote control of lighting circuits.
b. Remote control of 120VAC duplex receptacles (including inmate television receptacles).
c. Remote control of inmate telephone audio lines.
d. Remote control of water valves.
e. Remote control of visitation handsets.

3. Provide all labor, equipment, materials, and supervision to install, program, calibrate, adjust, document, and test the total system as required herein and on the drawings.

4. Each device or item shown on the security electronics drawings shall be assumed to be individually controlled, rather than group controlled, unless otherwise specified below or noted on the drawings. Some items may be both individually and group controlled.

5. Provide a fully integrated PLC-based control system, which shall allow for the remote control of auxiliary systems of the facility.

6. The PLC shall control via output points and interposing relays each device as scheduled.

B. Section Includes:

1. Relays
2. Component enclosures.
3. Cables.
4. Accessories.

1.4 DEFINITIONS

A. I/O: Input/output.

B. LAN: Local Area Network.

C. LED: Light-emitting diode.

D. Monitoring: Acquisition, processing, communication, and display of system and equipment status data and event and alarm signals.

E. MOV: Metal-oxide varistor.

F. Nonsecure: Closed and locked and with no unlock or open commands pending. (For doors and gates.)

G. PLC: Programmable logic controller.

H. Secure: Unlocked or open. (For doors and gates.)

I. Systems Integration: The bringing together of components of several systems containing interacting components to achieve indicated functional operation of combined systems.

J. Zone: A space or area defined on Drawings for a specific purpose.

1.5 ACTION SUBMITTALS

A. Product Data: For components for detention monitoring and control and systems integration. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.

1. Outline Drawings: Indicate dimensions, weights, arrangement of components, and clearance and access requirements.
2. Control Panel Layout: At full scale, show required artwork and device identification.
3. Wiring Diagrams: Detail specific power, control, signal, communication, and data wiring and cabling. Coordinate nomenclature and presentation with block diagram.
4. Raceway Riser Diagrams: Detail raceway runs required for detention monitoring and control and for systems integration. Include designation of devices connected by raceway, raceway type and size, and type and size of wire and cable fill for each raceway run.

1.6 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Submit certification that fabrication for completed equipment rack and control panel assemblies will withstand seismic forces defined in Section 27 0548.16 "Seismic Controls for Communications Systems." Include the following:

1. Description of features included in equipment and equipment assemblies to withstand anticipated acceleration loads.

2. Basis for Certification: Indicate whether withstand 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."

3. Dimensioned Outline Drawings of Equipment Racks and Control Panels: Identify center of gravity of fully equipped and assembled units and locate and describe mounting and anchorage provisions.
4. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Qualification Data: For Installer and Detention Electronic Systems Integrator.

C. Field quality-control reports.

D. Program documentation, software licenses, and backup copies of software used on Project.

E. Other Information Submittals:

1. Examination reports documenting inspections of substrates, areas, and conditions.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For detention monitoring and control equipment components to include in emergency, operation, and maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Relays: Two of each type used.
2. Wire and Cable Terminals: Five of each type and size used.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by detention door control manufacturer and detention monitoring and control equipment manufacturer and with detention facility construction and systems integration experience with the following electronic systems:

1. Fire alarm.
2. Intercommunications.
3. Paging.
4. Remote lighting and power controls.
5. Video surveillance.

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.

1.10 SERVICE CONDITIONS

A. Environmental Service Conditions: Systems, equipment, and components shall be capable of operating continuously in the following conditions without mechanical or electrical damage or degradation of operating capability:

1. Ambient Temperature: 140 deg F.
2. Relative Humidity: 10 to 95 percent, noncondensing.

B. Electrical Service Conditions: Equipment shall operate continuously in the following conditions without damage or degradation of operating capability:

1. Voltage Range for Equipment with a Nominal Rating of 120-V AC: 88 to 132 V.
2. Voltage Range for Equipment with a Nominal Rating of 24-V DC: 22 to 85 V.
3. Frequency Range for Equipment with a Nominal Frequency Rating of 60 Hz: 45 to 63 Hz.

1.11 COORDINATION

A. Coordinate Work of this Section with that of Sections specifying systems and components required to be integrated with detention monitoring and control equipment.

B. Coordinate features of detention monitoring and control components with those of related detention electronic systems.

1. Provide integrated interconnections of compatible components.
2. Match components and interconnections for optimum performance of indicated functions.

C. Coordinate work with Division 26 Contractor. Turn over to the Division 26 Contractor completely assembled and tested utility control cabinets/panels for mounting and termination of line-voltage wiring.

D. Coordinate work with Division 26 Contractor. Turn over to the Division 26 Contractor completely assembled and tested inmate telephone control cabinets. The inmate telephone control cabinet shall be mounted next to the inmate telephone system provided by the owners. Inmate telephone tip and ring terminations shall be provided by the owner's telephone system contractor. Data terminations shall be by Division 280100.

PART 2 - PRODUCTS

2.1 GENERAL SYSTEM REQUIREMENTS

A. The Auxiliary Control System shall provide for remote switching, on an individual or group basis of the following circuit types:

1. Lighting circuits (120V or 277V)

a. For lighting fixtures with night lights, the controlling relay shall be a minimum, single pole, double throw. The "DAY" light lamp/ballast switch legs shall be wired to the normally closed side of the relay, whereas the "NIGHT" light lamp/ballast switch legs shall be wired to the normally open side of the relay.

2. Receptacle circuits (120V unless otherwise noted on plan)

a. Includes inmate television circuits.

3. Inmate phone circuits
4. Water valve circuite (120V unless noted otherwise on plan)
5. Visitation handset circuits

B. All circuits shall be remotely controlled through the use of the VGUI system.

C. Fail Safe configuration: upon loss of power to the auxiliary system or failure of the PLC input and output modules, the system shall change state to the safest condition for the facility staff.

a. Lighting relays shall fail closed to allow lighting to be on, if lighting circuit is powered.
b. Receptacle relays shall fail open keeping staff safe from electric shock.
c. Inmate telephone relays will open to prevent use during a power failure.
d. Configure the system to automatically turn on lights, which are controlled in an area from which a duress alarm has been received.
e. Configure the system to automatically turn on all controlled lights when an emergency evacuation has been initiated.

2.2 RELAYS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Allen-Bradley/Rockwell Automation.
b. Emerson Electric Co. (GE Intelligent Platforms).
c. OMRON Corporation.
d. Eaton.

B. Description: Plug-in, [**electromagnetic**] [**solid-state electronic**] [**electromagnetic or solid-state electronic**] units. Arrange in relay assemblies that have the following features:

1. Fuse and SPD protection.
2. Indicating LED for each relay.
3. Optical isolation of input circuits to [**1500**] [**2500**] [**7500**] V.

C. Rating: A minimum of [**125**] [**150**] percent of the inrush current of controlled device, but not less than 6 A.

2.3 COMPONENT ENCLOSURES

A. Description: Metal cabinets, racks, and consoles, with welded frames, complying with UL 1610.

B. Doors, Covers, and Other Access Provisions:

1. Hinged Type: Flanged, with locks and nonremovable pins in hinges.
2. Screw Covers: Secure with security fasteners of type indicated or, if not indicated, flat-head (countersunk) security fasteners.
3. Locks: Pick-resistant, flush-tumbler type; three-point latching device for hinged doors or covers with latch edge more than 24 inches long.
4. Keys: Identical, unless otherwise indicated. Removable only when lock is locked.

C. Seismic Hardening: Increase rigidity of frames with additional welding and grinding of seams and addition of gussets at corners. Reinforce mounting and attachment provisions to resist seismic forces.

D. Mounting and Anchoring Provisions: Accessible only when doors or covers are open.[**Comply with applicable seismic criteria.**]

2.4 CABLES

A. Low-Voltage Control Cable: Multiple conductor, color-coded, No. 20 AWG copper, minimum.

B. Balanced Twisted-Pair Cable Comply with Section 271513 "Communications Copper Horizontal Cabling."

C. Optical Fiber Cables and Connectors: Comply with Section 271323 "Communications Optical Fiber Backbone Cabling."

2.5 ACCESSORIES

A. Interfaces with equipment specified in other Sections include accessories, adapters, electronic interface units, and connections required for functional performance indicated.

PART 3 - EXECUTION

3.1 SYSTEMS INTEGRATION

A. Integrate installations and connections of equipment and systems specified in this Section with those specified in the following Sections:

1. Section 28 5213 "Detention Monitoring and Control Systems Software" for VGUI system and PLC control system.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Anchor equipment to building structural elements and support according to requirements in Section 26 0529 "Hangers and Supports for Electrical Systems."

C. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounted items.

D. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

F. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

G. Right of Way: Give to raceways and piping systems installed at a required slope.

H. Security Fasteners: Where accessible to inmates, install detention monitoring and control components using security fasteners with head style appropriate for fabrication requirements, strength, and finish of adjacent materials, except that a maximum of two different sets of tools shall be required to operate security fasteners for Project. Provide stainless steel security fasteners in stainless steel materials.

3.3 GROUNDING

A. Class 2 Power - Limited Power, Signal, and Control Circuits: Ground systems and equipment according to manufacturer's written instructions.

3.4 INSTALLATION OF WIRES AND CABLES

A. Low-Voltage Analog Circuits: Install wiring as specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Balanced Twisted-Pair Cabling: Install as specified in Section 271513 "Communications Copper Horizontal Cabling."

C. Optical Fiber Cable: Balanced Twisted-Pair Cabling: Install as specified in Section 271323 "Communications Optical Fiber Backbone Cabling."

D. Bundle, train, and support wire and cable in enclosures.

E. Connections: Make connections according to manufacturer's wiring diagrams, unless otherwise indicated.

F. Wiring Method: Install wire and cable in metal raceway except where another wiring method is indicated.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 0544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Comply with requirements in Section 07 8413 "Penetration Firestopping."

3.7 IDENTIFICATION

A. Identify electrical components and power wiring according to Section 260553 "Identification for Electrical Systems."

B. Identify security components and control wiring according to Section 280553 "Identification for Communications Systems."

C. Label each relay and relay enclosure with a unique designation that is consistent with wiring diagrams and schedules in operation and maintenance manual. Label conductors and cables at each end and where exposed within troughs and pull-and-junction boxes.

3.8 FIELD QUALITY CONTROL

A. ESSI shall perform the following tests and inspections:

1. Schedule visual and mechanical inspections and electrical tests with at least seven days' advance notice.
2. Inspect auxiliary systems control components for defects and physical damage, labeling of testing laboratory, and nameplate compliance with the Contract Documents.
3. Inspect interiors of enclosures, including the following:

    a. Integrity of mechanical and electrical connections.
    b. Component type and labeling verification.
    c. Ratings of installed components.

4. Electrical Tests: Use caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:

    a. Continuity tests of circuits.
    b. Operational Tests: Set and operate controls at each control panel and at each monitored and controlled device to demonstrate their functions and capabilities. Use a methodical sequence that cues and reproduces actual operating functions as recommended by manufacturer. Record response to each test command and operation, including logging and printout of events. Record time intervals between initiation of alarm conditions and registration of alarms at control (panel), and between initiation of commands and execution at controlled equipment.

        1) Coordinate testing required by this Section with that required by Sections specifying equipment being monitored and controlled and systems to be integrated with detention monitoring and control work.
        2) Simulate malfunctions to verify protective features and appropriate alarm indications.

5. Seismic-restraint tests and inspections shall include the following:

    a. Type, size, quantity, arrangement, and proper installation of mounting or anchorage devices.
    b. Test mounting and anchorage devices according to requirements in Section 27 0548.16 "Seismic Controls for Communications Systems."

6. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.

7. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.
8. Record of Tests and Inspections: Maintain and submit documentation of tests and inspections, including references to manufacturers' written instructions and other test and inspection criteria. Include results of tests, retests, and inspections. Include printout of testing event log, annotated to provide a machine record of testing that corresponds to written test records.

B. Prepare test and inspection reports.

3.9 DEMONSTRATION

A. ESSI shall train Owner's staff personnel to adjust, operate, and maintain systems.

B. Provide training covering features, capabilities, and operation of installed control panels. Show cause-and-effect sequences during operation. Cross-reference instruction manuals throughout. Follow same order of presentation as instruction manual. Include the following:

END OF SECTION

SECTION 31 1000

SITE CLEARING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General & Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. All work, installation, procedures, materials, etc. shall be in conformance with the Standard Specifications for Road and Bridge Construction, adopted January 1, 2022, along with Supplemental Specifications and Recurring Special Provisions, adopted January 1, 2022, by the Illinois Department of Transportation (herein referred to as the Standard Specifications) except as modified by this Specification.

1.02 SUMMARY

A. The CONTRACTOR shall furnish all labor, materials, equipment and means to clear and grub the project site as shown on Contract Drawings or required to permit the installation of the facilities and dispose of the materials. CONTRACTOR shall pay for all permits required under this Specification.

B. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and removing site utilities.
7. Temporary erosion and sedimentation control measures.

C. Related Sections:

1. Section 312000 – Earth Moving
2. Section 315000 – Excavation Support and Protection

1.03 QUALITY ASSURANCE

A. Contractors Organization

1. CONTRACTOR shall have a competent supervisor onsite during the process of the work who shall act for the CONTRACTOR in all matters concerning the work. He shall have the authority to receive and to act upon directions from the OWNER.

1.04 MATERIAL OWNERSHIP & CONSTRUCTION WASTE MANAGEMENT

A. Except for stripped topsoil or other materials indicated to remain OWNER's property, cleared materials shall become Contractor's property and shall be removed from Project site in accordance with the Construction Waste Management practices required under Division 1.

1.05 UNDERGROUND FACILITIES

A. Underground Facilities

1. The information and data shown or indicated in the Construction Drawings with respect to existing Underground Facilities at or contiguous to the site is based on information and data furnished to OWNER or ARCHITECT/ENGINEER by the owners of such Underground Facilities or by others. The OWNER and ARCHITECT/ENGINEER shall not be responsible for the accuracy or completeness of any such information or data. The cost of all of the following will be included in the Contract Price and CONTRACTOR shall have full responsibility for:

a. Reviewing and checking all such information and data;
b. Locating all Underground Facilities shown or indicated in the Contract Documents;
c. Coordinating the Work with the owners of such Underground Facilities during construction; and,
d. Maintaining the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

2. Utility Locator Service: Notify J.U.L.I.E. for public utility location marking before site clearing. CONTRACTOR shall employ Private Utility Locating Service for marking utilities onsite that are private.

B. Access: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

C. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Contractor.
1. Do not proceed with work on adjoining property until authorized by property owner.
2. Contractor shall provide documentation to roadway district if access to public right-of-way is needed. The following forms or permits shall be coordinated by the Contractor:
a. Right-of-Entry Permit
b. Protective Liability Insurance, if necessary.

D. Blasting and fires will not be permitted.

PART 2 PRODUCTS

2.01 MATERIALS

A. The CONTRACTOR shall provide all materials and equipment required to complete all site clearing in accordance with this Section.

B. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 – Earth Moving.

2.02 EROSION CONTROL MEASURES

A. The CONTRACTOR shall follow the construction drawings and details for proper materials and installation of erosion control measures. This includes, but is not limited to, the following:
1. Siltation Control Fencing.

B. When local and/or state land disturbance codes and ordinances require more stringent erosion control methods, products, or installation, the more stringent codes shall be followed.

PART 3 EXECUTION

3.01 PREPARATION

A. Contractor is responsible for providing any and all surveying/staking needed to place site improvements in correct locations, as outlined on the construction drawings. Protect and maintain survey benchmarks and survey control points from disturbance during construction.

B. Install erosion and sedimentation control measures as outlined on the construction drawings.

C. Locate and clearly flag all trees scheduled for removal as shown on the construction drawings. Install orange plastic safety fencing at the drip line of all trees marked to remain.

D. Protect all existing site features to remain from damage during construction. If damage occurs to any existing site features scheduled to remain, the Contractor shall immediately contact the OWNER's Representative. Restore damaged features to their original condition, as acceptable to the Using Agency's Representative, and at no additional cost.

E. Carefully remove all items indicated to be salvaged on the plan drawings and store within construction staging area.

3.02 CLEARING, TREE REMOVAL, & PROTECTION, CARE, & REPAIR OF EXISTING PLANTS

A. Clearing, and grubbing, tree and hedge removal shall be performed in accordance with the Standard Specification Section 201 - Clearing and Grubbing, with the following exception: At locations where new structures will be constructed, the tree stumps and all roots within the limits of the proposed foundations shall be completely removed, instead of just being removed 12-inches below grade.
   1. Removal stumps and roots over 3-inches within the limits of grubbing to the following depths:
      a. Fill Areas: 12” below natural ground line
      b. Cut Areas: 18” below finish grade

3.03 DISPOSAL

A. The CONTRACTOR shall dispose of all surplus, unstable and unsuitable materials and organic waste in accordance with Section 202.03 – “Removal and Disposal of Surplus, Unstable, and Unsuitable Materials and Organic Waste” of the Standard Specifications.

3.04 PREPARATION

A. Protection of persons and property shall be provided throughout the progress of the work. Barricade open depressions and excavations occurring as part of this work, and post warning lights on property adjacent to or within public access. The work shall proceed in such a manner as to minimize the spread of dust and flying particles, and to provide safe working conditions and personnel. Protect trees and shrubs, where indicated to remain, by providing a fence around the tree or shrub of sufficient height so trees and shrubs will not be damaged in any way as part of this work. CONTRACTOR shall employ a licensed Arborist to repair damage to any tree or shrub at no cost to the OWNER. Replace trees and shrubs that cannot be repaired and restored to full-growth status as determined by the Arborist.
B. Before starting work, utilities shall be disconnected at the nearest sources of supply unless otherwise indicated or directed. Mains, sewers, and utilities shall be sealed in an approved manner acceptable to the utility involved.
C. Protect curbs, structures, utilities, sidewalks, pavements, and other facilities within the project limits from damage. CONTRACTOR shall replace / repair damage in kind at no cost to OWNER.

3.05 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
   1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
   2. Paint ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer’s written instructions. Keep paint off surfaces that will remain exposed.

END OF SECTION

SECTION 31 2000

EARTH MOVING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General & Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. All work, installation, procedures, materials, etc. shall be in conformance with the Standard Specifications for Road and Bridge Construction, adopted January 1, 2022, along with Supplemental Specifications and Recurring Special Provisions, adopted January 1, 2022, by the Illinois Department of Transportation (herein referred to as the Standard Specifications) except as modified by this Specification.

C. Project Geotechnical Report, as completed by Midwest Engineering and Testing, Inc.

1.02 SUMMARY

A. Earthwork shall consist of all work required to construct the earth grade to the lines, grade, and cross sections called for on the Contract Drawings and Specifications. Earthwork shall consist of, but is not limited to, excavation, removal, and satisfactory disposal of all materials and seeding; and the removal and satisfactory disposal of unstable and unsuitable materials and the replacement with satisfactory materials where required. All costs for obtaining materials from an off-site borrow area, a site for dumping waste materials, the hauling of materials to and from these areas, and erosion control shall be the CONTRACTOR's responsibility. The CONTRACTOR shall pay for all permits required under this Specification.

B. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete and slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Subbase course and base course for asphalt paving.
7. Subsurface drainage backfills for walls and trenches.
8. Excavating and backfilling trenches for utilities and pits for buried utility structures.

C. Related Sections:

1. Section 311000 - Site Clearing.
2. Section 329200 – Turf and Grasses

1.03 SUBMITTALS

A. Topsoil or fill materials obtained from a borrow source on or off the site shall be approved by the GEOTECHNICAL ENGINEER prior to moving the topsoil or fill materials to the jobsite.

1.04 QUALITY ASSURANCE

A. The **CONTRACTOR** shall employ a GEOTECHNICAL ENGINEER to observe and test excavations and compacted fill. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2,000 square feet of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150-feet or less of trench length, but no fewer than two tests.

B. The CONTRACTOR will provide staking to establish the grades and elevations indicated on the project grading plan.

C. Project Conditions
   1. Do not use frozen materials or materials mixed with ice or frost.
   2. Do not build on frozen work or saturated sub-grade or sub-base materials.
   3. Protect completed sub-grades from construction equipment.

D. Contractors Organization
   1. CONTRACTOR shall have a competent supervisor onsite during the process of the work who shall act for the CONTRACTOR in all matters concerning the work. He shall have the authority to receive and to act upon directions from the OWNER.

1.05 WARRANTY

A. The CONTRACTOR shall warrant all construction associated with the CONTRACT to be free from defects for a period of 1-year from the date of final acceptance by the OWNER.

PART 2 PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be relatively free from large roots, sticks, weeds, brush, or stones larger than 1 inch in diameter or other litter and waste products. It shall be a loamy mixture having at least 90% passing the No. 10 sieve. A sample, free from extraneous materials, shall comply with the following requirements:
   1. It shall contain not less than 12% or more than 35% clay as determined in accordance with AASHTO T- 88.
   2. The sand content shall not exceed 15% as determined in accordance with AASHTO T- 88.
   3. The pH of the sample shall not be lower than 5.0 or higher than 8.0. The pH shall be determined with an acceptable pH meter, on the portion of the sample passing No. 10 sieve, in accordance with the "Suggested Methods of Tests for Hydrogen Ion Concentration (pH) of Soils" included in the procedures for Testing Soils issued December 1964 by the American Society for Testing Materials.

2.02 FILL AND BACKFILL MATERIALS

A. Earth Fill Materials
   1. Earth fill shall be constructed of materials that will compact and develop stability satisfactory to the GEOTECHNICAL ENGINEER. No sod, frozen material, organics, contaminated soil, or any material which may decay or otherwise might cause settlement shall be placed or allowed to be utilized as earth fill.
   2. No rocks, stones, or broken concrete more than four (4) inches in largest dimensions shall be permitted within a vertical distance of 24 inches from the surface of the finished grade. In areas exterior to structural construction no stones, rocks, broken concrete, etc. will be allowed in the filled area larger than two (2) inches in diameter. Rock shall not exceed 15% of the fill material volume.
   3. Earth fill materials may be obtained from excavation on site provided it is approved by the GEOTECHNICAL ENGINEER. If other approved earth fill materials obtained from the excavation of this site are insufficient to complete fill areas to the grades as required by the Construction Drawings, the CONTRACTOR shall obtain necessary earth fill materials from an off-site source of supply.

C. Trench Backfill for Utilities
   1. Trench backfills for utilities shall be IDOT Gradation FA-1, FA-2, FA-6, FA-21, CA-6, CA-10, or CA-18 as specified in Section 1004 – COARSE AGGREGATE and Section 1003 - FINE AGGREGATE of the IDOT Standard Specifications.

PART 3 EXECUTION

3.01 CONTRACTOR PREPARATION

A. The CONTRACTOR shall notify the ARCHITECT/ENGINEER and GEOTECHNICAL ENGINEER at least 48 hours in advance of the start of the grading and/or excavation operations. Samples of off-site borrow materials must be provided to the GEOTECHNICAL ENGINEER at least 4 days in advance of using the material to allow time to complete laboratory moisture density tests.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

C. Protect and maintain erosion and sedimentation controls during earth-moving operations.

D. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

E. Excavation shall be properly supported in accordance with the requirements of the Occupational Safety and Health Administration (O.S.H.A.) and all state and local agencies governing safety and health on the work site. The support of all excavations shall be provided by the CONTRACTOR at no additional expense to the OWNER.

3.02 STRIPPING TOPSOIL

A. All topsoil and vegetation should be removed from the area of construction. Under no circumstances shall new construction obtain its structural support from topsoil. If the GEOTECHNICAL ENGINEER determines the removed material is suitable for reuse later, it may be stockpiled to height limits of 6-feet; if unsuitable, the CONTRACTOR shall remove the material from the jobsite.

B. Stockpiled topsoil shall be covered / stabilized in accordance with the Storm Water Pollution Prevention Plan.

3.03 EXCAVATIONS

A. General: Excavation shall consist of the satisfactory removal and disposal of all materials taken from within the limits of the work contracted, meaning the material lying between the original ground line as shown on the Construction Drawings regardless of whether the original ground line is exposed to air or is covered by water. Excavation below existing ground line to enable any required construction or removal is included. It is distinctly understood that any reference to earth, rock, silt, debris, or other materials on the Construction Drawings or in the Specifications is solely for the OWNER'S information and shall not be taken as an indication of classified excavations or other quantity of earth, rock, silt, debris, or other material.

B. Existing Structures: Onsite structures and any underground structures (i.e., basements, footings, walls, slabs, pipes, utilities, etc.) and associated backfill must be removed entirely and the resulting excavation replaced with compacted fill. Replace the material in compacted lifts compacted to at least 95 percent of the material’s standard Proctor maximum dry density.

C. New Structures: Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1-inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

   1. Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

D. Walks and Pavements: Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

E. Utility Trenches: Excavate trenches to indicated gradients, lines, depths, and elevations. Provide over-dig of trench such that excavation is deeper than bottom of pipe elevation depth as indicated, to allow for bedding course. Hand excavate for bell of pipe.
F. Unauthorized: Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by ARCHITECT/ENGINEER.

3.04 SITE PREPARATION

A. Care should be exercised to maintain the integrity of the subgrade when preparing the site for the placement of fill, making excavations, and other earth-related construction activities. If pumping and rutting occur, activity should be halted until the affected area can be stabilized. This can normally be accomplished with aeration and recompaction, the use of ground stabilization fabric, or a working mat of clean coarse crushed stone.
B. The existing subgrade soils at the portions of the site where fill is not necessary (cut areas) shall be proof-rolled.
    1. Proof-roll subgrade with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excessive yielding. Do not proof-roll wet or saturated subgrades. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit speed to 3 mph.
    2. Proof-rolling shall be completed to reveal any zones of excessively soft, wet, disturbed, or otherwise unsuitable soil. The unacceptable materials shall be removed and the excavations backfilled with engineered fill. After the soft soils are removed and replaced with structural fill, the subgrade in areas to receive fill shall be scarified to a depth of about 6 inches and compacted to a minimum dry density of 95 percent of the maximum dry density as determined by the standard Proctor test (ASTM D 698). Density tests shall be performed on the compacted subgrade to verify dry density and compaction. All tests shall be approved by the GEOTECHNICAL ENGINEER.
C. Prior to the placement of fill beneath any structure or paved area, the GEOTECHNICAL ENGINEER shall confirm the structural integrity of the existing soils to receive the fill. Also prior to fill placement, settlement shall be monitored by the GEOTECHNICAL ENGINEER by placing settlement plates across the fill areas in the building pads, monitoring their settlement during and after fill. Placement of structural fill shall be placed as early as possible in the construction schedule prior to installation of pavement and building subgrade. Upon completion, the GEOTECHNICAL ENGINEER shall confirm the structural integrity of the compacted structural fill.
D. High plastic soil or fill present within 24-inches of footings or 12-inches of the pavement section subgrade shall be removed and replaced with low plastic structural fill materials or granular material (Low plastic structural fill shall be defined as silty clays with a liquid limit of 45 or less / plasticity index of 25 or less, and Granular materials shall be defined as 1-inch minus gradation crushed limestone). Fill and replacement material shall be placed in 8-inch lifts compacted to at least 95 percent of the material's standard Proctor maximum dry density. Alternatives for remediation may be approved onsite by the GEOTECHNICAL ENGINEER.

3.05 PLACING FILL AND BACKFILL

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
B. Backfill and fill materials shall be properly moistened/dried to within three percent (wet or dry) of the optimum moisture.
C. Install utility warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements.

C. Compacting equipment and compacting operations shall be coordinated with the rate of placing controlled earth fill so that the required density is obtained. The GEOTECHNICAL ENGINEER shall perform sufficient tests to establish that materials are placed in conformance with the Contract Drawings and Specifications.

3.06 COMPACTION

A. Compact fill, backfill, and prepare subgrades to not less than the following percentages of maximum dry density as determined by the standard Proctor test, according to ASTM D 698.
   1. Under structures, building slabs, steps, pavements, and sidewalks, compact and prepare subgrade and each layer of backfill or fill material to 95 percent of the standard Proctor maximum dry density.
   2. Under lawn or unpaved areas, compact and prepare subgrade and each layer of backfill or fill material to 85 percent of the standard Proctor maximum dry density.

3.07 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.08 GRADING

A. General: Uniformly grade areas to smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations on plans.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
   1. Turf or Unpaved Areas: Plus or minus 1-inch
   2. Walks: Plus or minus 1-inch
   3. Pavements: Plus or minus 1/2-inch

C. Grading inside Building Lines: Finish subgrade to a tolerance of ½-inch when tested with a 10-foot straightedge.

3.09 TOPSOIL PLACEMENT

A. All areas disturbed by grading and construction operations, but not covered by structures, pavement, or trees, shall be covered with a minimum of four (4) inches of topsoil. After all excavated areas have been backfilled, the CONTRACTOR shall grade the areas disturbed by construction which changed the contour, allowing for and providing a four (4) inch minimum thickness of approved topsoil. All areas shall be graded to the elevations and contours as indicated by the Construction Drawings. The topsoil surface shall be trimmed and raked to true lines free from unsightly variations, humps, ridges, or depressions. The ground shall be sloped to provide positive drainage away from all buildings. Finish grading shall be left in a condition for grass seeding.

3.10 EROSION CONTROL

A. The CONTRACTOR shall use existing erosion control in accordance with the drawings, provide erosion control in any area the CONTRACTOR deems necessary to prevent erosion during construction, in any area which shows signs of erosion, or as directed by the ARCHITECT/ENGINEER. The CONTRACTOR shall use an erosion control method of his choice in any given area unless such a method has failed earlier at that location or a method has been specified on the drawings. The ARCHITECT/ENGINEER shall determine whether or not any specific erosion control method is successful.

B. The CONTRACTOR shall be responsible for complying with the requirements of the IEPA NPDES storm water permit for construction activity for this project.
C. The CONTRACTOR shall be responsible for implementing the Storm Water Pollution Prevention Plan (SWPPP) that will be kept onsite for inspection by the IEPA, if requested.

3.11 JOB CONDITIONS, DUST CONTROL AND MONITORING

A. The CONTRACTOR shall conduct earthwork operations in a manner that will limit dust, noise, and other nuisances. If necessary, water shall be applied to the soil to limit dust, etc. All earthwork operations shall be conducted in accordance with local government regulations.

END OF SECTION

SECTION 31 2500

STORM WATER POLLUTION PREVENTION PLAN

PART 1 GENERAL

1.01 PURPOSE

A. In general, construction activities produce many kinds of pollutants which may cause storm water contamination problems. Grading activities remove grass, rock, pavement, and other protective ground covers resulting in the exposure of underlying soils to the elements. Since the soil surface is unprotected, soil particles are easily picked up by wind and rain. This process is called erosion. The water carrying these particles eventually slows down enough and causes the soils to come out of suspension in sewer pipes, sewer structures, storm water ditches, river and stream beds, and lakes. Gradually, layers of these soils build up in stream beds, choking the river and stream channels and covering the areas where fish spawn and plants grow. This process is called sedimentation. The suspended soil particles also cloud waters causing aquatic respiration problems, killing fish and plants. Muddy storm water deposits at the project site can also be a messy nuisance, causing storm pipe blockages and in some cases, cause delays in construction activities. The construction of buildings and roads may also require the use of toxic or hazardous materials such as petroleum products, pesticides, herbicides, asphalt, sealants, etc. which may pollute storm water running off the construction site. These types of pollutants often contain small amounts of metals and other toxic materials which may be harmful to humans, fish and plants. The goal of this storm water pollution prevention plan (SWPPP) is to improve water quality by reducing pollutants associated with the construction storm water discharge.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General & Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. All work, installation, procedures, materials, etc. shall be in conformance with the Standard Specifications for Road and Bridge Construction, adopted January 1, 2022, and the Supplemental Specifications and Recurring Special Provisions, adopted January 1, 2022, by the Illinois Department of Transportation (herein referred to as the Standard Specifications) except as modified by this Specification, and the Illinois Urban Manual.

C. CONTRACTOR(s) shall be familiar with the current edition of the Illinois Urban Manual, as developed by the Natural Resources Conservation Service and the Illinois Environmental Protection Agency, available for viewing at:
http://www.aiswcd.org/illinois-urban-manual/
The Illinois Urban Manual list of standard drawings can be viewed at:
http://www.aiswcd.org/wp-content/uploads/2013/06/urbstls11.pdf

1.03 CERTIFICATIONS

A. OWNER - "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

1. Owner Name:
2. Address:
3. Phone:
4. Authorized Representative Name:
5. Title:
6. Signature:
7. Date:

B. CONTRACTOR – This certification statement is part of the Storm Water Pollution Prevention Plan, in accordance with the General NPDES Permit No. ILR10 issued by the Illinois Environmental Protection Agency. "I certify under penalty of law that I understand the terms of the general National Pollutant Discharge Elimination System (NPDES) permit ILR10) that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification. In addition, I have read and understand all of the information and requirements stated in the Storm Water Pollution Prevention Plan for this project; I have provided all documentation required to be in compliance with the ILR10 and Storm Water Pollution Prevention Plan and will provide timely updates to these documents as necessary."

1. Contractor Name:
2. Address:
3. Phone:
4. Authorized Representative Name:
5. Title:
6. Signature:
7. Date:

1.03 SITE DESCRIPTION

A. Nature of Construction Activity - **The project will consist of a building addition to the Champaign County Satellite Jail. Additional work includes grading, new utilities, new sewers, new pavement, new geothermal field, and new fencing.**

B. Sequence
   1. Install soil erosion and sediment control measures
   2. Strip and stockpile topsoil / protect with temporary seeding and silt fence
   3. Clear and grade site
   4. Apply temporary seeding
   5. Construct all sewers and utilities
   6. Complete pavements and buildings.
   7. Apply final seeding

C. Site Area

1. Disturbed Area: **2.93 acres**

D. Receiving Waters
   1. The drainage shall continue to flow to predevelopment areas during construction and following completion of the project

E. Site Features and Sensitive Areas to be Protected
   1. Special care is requested of the CONTRACTOR to prevent sediment runoff into downstream drainage facilities.

F. Potential Sources of Pollution (sediment to storm water runoff):
   1. Clearing and grubbing
   2. Grading and excavating
   3. Topsoil Stripping and Stockpiling
   4. Utility Installation
   5. Paving

G. Potential pollutants and sources (other than sediment) to storm water runoff
   1. Combined Staging Area - small fueling activities, minor equipment maintenance, and sanitary facilities
   2. Materials Storage Area - general building materials, solvents, adhesives, paving materials, paints, aggregates, and trash.
   3. Construction Activity - paving, curbing installation, and concrete pouring.
   4. Concrete Washout Area

PART 2 PRODUCTS

2.01 SILT FENCE

A. Provide in accordance with Section 280 and 1080.02 of the Standard Specifications and the IDOT Highway Standard 280001-07 as shown on the plans or the Illinois Urban Manual Standard Drawing IUM-620A.

2.02 DITCH CHECKS

A. Rolled Excelsior per Section 280 of the Standard Specifications; or

B. Urethane Foam / Geotextile per Plans or IL Urban Manual Standard IL-542.

2.03 INLET PROTECTION

A. Provide in accordance with the IDOT Highway Standard 280001-07.

2.04 MULCH, EROSION CONTROL BLANK, AND TURF REINFORCEMENT MAT

A. Provide in accordance with Section 251 of the IDOT Standard Specifications or the Illinois Urban Manual Standard Drawing IUM-530.

2.05 OPERATION CONTROLS

This section of the plan addresses the controls that will be implemented for each of the major construction activities described above. For each measure discussed, the contractor will be responsible for its implementation as indicated. The contractor shall provide a plan for the implementation of the measures indicated, and keep at the jobsite. The contractor, and subcontractors, shall update the plan with any proposed changes, maintenance, or modifications to keep construction activities com-

pliant with the permit. Each such contractor shall sign the required certification on forms which are part of this plan.

A. Erosion and Sediment Controls – The controls utilized for this project will at a minimum provide the following:
   1. Control storm water volume and velocity within the site to minimize soil erosion;
   2. Control storm water discharges, including both peak flow rates and total storm water volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion;
   3. Minimize the amount of soil exposed during construction activity;
   4. Minimize the disturbance of steep slopes;
   5. Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting storm water runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site;
   6. Provide and maintain natural buffers around surface waters, direct storm water to vegetated areas to increase sediment removal and maximize storm water infiltration, unless infeasible; and
   7. Minimize soil compaction and, unless infeasible, preserve topsoil.

B. Stabilization Practices - Provided below is a description of interim and permanent stabilization practices, including site specific scheduling of the implementation of the practices. Site plans will ensure that existing vegetation is preserved where attainable and disturbed portions of the site will be stabilized. The following Stabilization Practices will be used for this project:
   1. Phase Construction Activity
      a. Temporary erosion and sedimentation controls shall be placed prior to commencement of construction grading.
      b. Minimize disturbance of areas until it is necessary for construction to proceed.
   2. Control Storm Water Flowing onto and through the Project
      a. CONTRACTOR shall be responsible for controlling surface water during the course of the construction activities. Surface water may need to be diverted through the site via CONTRACTOR determined means and methods. Water ponding in excavation areas may be removed in accordance with project specifications for dewatering; however, discharge from these activities shall comply with sediment capture standards applicable to this project.
   3. Provide Temporary and Permanent Seeding
      a. CONTRACTOR shall be responsible for placing temporary and permanent seeding in accordance with the NPDES permit. The seeding shall be covered with mulch, erosion control blanket or turf reinforcement mat as shown on the plans and in accordance with Section 250 of the Standard Specifications.

C. Structural Practices: Provided below is a description of structural practices that will be implemented, to the degree attainable, to divert flows from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Such practices may include but are not limited to: perimeter erosion barrier, earth dikes, drainage swales, sediment traps, ditch checks, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins. The following Structural Practices will be used for this project:
   1. Protect Storm Drain Inlets

a. Inlet Protection shall be used to capture sediment at the inlet to a storm drain, allowing full use of the drain system during the construction period.

b. Ditch Checks shall be used to trap sediment from disturbed areas by reducing the velocity of flow in drainage swales. The ditch checks capture sediment by ponding water to allow deposition, not by filtration.

2. Establish Perimeter Controls and Sediment Barriers
   a. Silt Fence shall be used to trap sediment from disturbed areas by reducing the velocity of sheet flow. Silt fences capture sediment by ponding water to allow deposition, and not by filtration (IUM Code 920).
3. Establish Stabilized Construction Exits
   a. Stabilized Construction Entrance (Illinois Urban Manual IL-630)
   b. Construction Road Stabilization (Illinois Urban Manual Code 930)

A. Other Controls:
   1. Vehicle Entrances and Exits - Stabilized construction entrances and exits must be constructed to prevent tracking of sediments onto roadways.
   2. Material Delivery, Storage, and Use - The following BMPs shall be implemented to help prevent discharges of construction materials during delivery, storage, and use:
      a. All products delivered to the project site must be properly labeled.

      b. Water tight shipping containers and/or semi trailers shall be used to store hand tools, small parts, and most construction materials that can be carried by hand, such as paint cans, solvents, and grease.

      c. A storage/containment facility should be chosen for larger items such as drums and items shipped or stored on pallets. Such material is to be covered by a tin roof or large sheets of plastic to prevent precipitation from coming in contact with the products being stored.

      d. Large items such as light stands, framing materials and lumber shall be stored in the open in a general storage area. Such material shall be elevated with wood blocks to minimize contact with storm water runoff.

      e. Spill clean-up materials, material safety data sheets, an inventory of materials, and emergency contact numbers shall be maintained and stored in one designated area and each CONTRACTOR is to inform his/her employees and the OWNER of this location.
   3. Waste Disposal. No materials, including building materials, shall be discharged into Waters of the State, except as authorized by a Section 404 permit.
   4. The provisions of this plan shall ensure and demonstrate compliance with applicable State and/or local waste disposal, sanitary sewer or septic system regulations.

   5. The CONTRACTOR shall provide a written and graphic plan to the OWNER identifying where each of the above areas will be located and how they are to be managed.

B. Approved State or Local Laws
   1. The management practices, controls and provisions implemented in this plan shall be in accordance with IEPA's Illinois Urban Manual and / or IDOT specifications, which are at least as protective as the requirements contained in the Illinois Environmental Protection Agency's Illinois Urban Manual.

PART 3 EXECUTION

3.01 MAINTENANCE

The following is a description of procedures that will be used to maintain, in good and effective operating conditions, the vegetation, erosion and sediment control measures and other protective measures identified in this plan.

A. Silt Fence
    1. Install prior to beginning any construction activity which will potentially create erodible conditions. Damaged silt fence shall be removed and replaced as needed. Excess sediment behind silt fences shall be removed and property disposed when sediment reaches one-third the height of the fabric.

B. Stabilized Access
    1. The exit shall be maintained in its original installation condition to prevent tracking of sediment on public right-of-way. Restoring the exit to its original condition may be accomplished by top dressing with additional rock, removing and replacing the top layer of rock, or washing the entrance. Sediment washed onto public right-of-way shall be removed immediately.

C. Ditch Checks
    1. Install immediately upon completion of the excavation and grading work to establish the proper grade of each channel for which at least one ditch check has been specified. Contractor to remove sediment that accumulates behind the ditch check.

D. Inlet and Pipe Protection
    1. For storm sewers and inlets, place prior to any construction activity that will potentially create erodible conditions. Protection shall be inspected frequently, and removed and replaced as necessary.

3.02 INSPECTIONS

Qualified personnel (provided by the GENERAL CONTRACTOR) shall inspect disturbed areas of the construction site which have not yet been finally stabilized, structural control measures, and locations where vehicles and equipment enter and exit the site. Such inspections shall be conducted at least once every seven (7) calendar days and within 24 hours of the end of a storm or by the end of the following business or work day that is 0.5 inches or greater or equivalent snowfall. Inspections forms (attached to this document) must be completed at the above mentioned inspection intervals by the qualified personnel. Inspections may be reduced to once per month when construction activities have ceased due to frozen conditions. Weekly inspections shall recommence when construction activities are conducted, or if there is 0.5” or greater rain event, or a discharge due to snowmelt occurs.

A. Disturbed areas, use areas (storage of materials, stockpiles, machine maintenance, fueling, etc.), borrow sites, and waste sites shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the plan shall be observed to ensure that they are operating correctly. Discharge locations or points that are accessible, shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles enter or exit the site shall be inspected for evidence of offsite sediment tracking.

B. If any violation of the provisions of this plan is identified during the conduct of the construction work covered by this plan, the GENERAL CONTRACTOR shall notify the appropriate IEPA Field Operations Section office by email at: epa.swnoncomp@illinois.gov, telephone or fax within 24 hours of the incident. The GENERAL CONTRACTOR shall then complete and submit an “Incidence of Noncompliance” (ION) report for the identified violation within 5 days of the incident. The GENERAL CONTRACTOR shall use forms provided by the Illinois Environmental Protection Agency and shall include specific information on the cause of noncompliance, actions which were taken to prevent any further causes of noncompliance, and a statement detailing any environmental impact which may have resulted from the noncompliance. All reports of noncompliance

shall be signed by a responsible authority in accordance with Part VI.G of the NPDES General Permit ILR10.

1. The Incidence of Non-Compliance (ION) can be downloaded at: http://www.epa.state.il.us/water/permits/storm-water/storm-water-forms.html
2. The ION form should be completed by the GENERAL CONTRACTOR and forwarded to the University Facility & Services Environmental Compliance Department for review and IEPA agency submittal.

3.03 DURATION OF EROSION CONTROL MEASURES

A. The Contractor will be responsible for the continued and proper maintenance of all erosion control measures until the vegetative ground surface cover has been established such that further presence of the measures is not required to protect against erosion.

B. The Contractor shall be responsible for the removal of all erosion control measures but only after the Engineer has approved removal of such.

C. The Contractor shall be responsible for the proper and lawful disposal of all materials used for the temporary erosion control measures.

3.04 NON-STORM WATER DISCHARGES

Except for flows from firefighting activities, sources of non-storm water that is combined with storm water discharges associated with the industrial activity addressed in this plan must be described below. Appropriate pollution prevention measures, as described below, will be implemented for the non-storm water component(s) of the discharge.

A. Spill Prevention and Control - BMPs shall be implemented to contain and clean-up spills and prevent material discharges to the storm drain system. The CONTRACTOR shall produce a written plan stating how his/her company will prevent, report, and clean up spills and provide a copy to all of his/her employees and the OWNER. The CONTRACTOR shall notify all of his/her employees on the proper protocol for reporting spills. The CONTRACTOR shall notify OWNER of any spills immediately.

B. Concrete Residuals and Washout Wastes - The following BMPs shall be implemented to control residual concrete, concrete sediments, and rinse water:
   1. The CONTRACTOR shall have the location of temporary concrete washout facilities approved by the OWNER or designated representative.
   2. Concrete waste solids/liquids shall be disposed of properly.

C. Vehicle and Equipment Cleaning - Vehicles and equipment are to be cleaned in designated areas only, preferably off site. Onsite maintenance must be performed in accordance with all environmental laws such as proper storage and no dumping of old engine oil or other fluids on site.

3.05 RECORDKEEPING / RETENTION OF RECORDS

A. The following is a list of records that shall be kept at the project site, available for viewing and for inspectors to review.
   1. Dates of Construction Activity
   2. Dates of Stabilization
   3. Inspection Reports

B. CONTRACTOR shall retain copies of storm water pollution prevention plans and all records, reports and notices required by this plan, for a minimum period of at least 3 years after the permit is terminated.

3.06 FINAL STABILIZATION / NOTICE OF TERMINATION

A. Upon final stabilization of the project site, the CONTRACTOR shall notify the OWNER of this project milestone. The Contractor shall then coordinate with the Owner the completion of a Notice of Termination.

1. The Notice of Termination (NOT) can be downloaded at:

https://www2.illinois.gov/epa/topics/forms/water-permits/storm-water/Pages/construction.aspx

2. The NOT form should be completed by the CONTRACTOR and sent to the Illinois EPA.

SECTION 31 3116
TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chemical soil treatment.

1.02 REFERENCE STANDARDS

A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; 2019.

1.03 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, and Samples, for submittal procedures.

B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.

C. Test Reports: Indicate regulatory agency approval reports when required.

D. Maintenance Data: Indicate re-treatment schedule .

E. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing this type of work.
   1. Having minimum of three (3) years documented experience.
   2. Approved by manufacturer of treatment materials.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 CHEMICAL SOIL TREATMENT

A. Toxicant Chemical: EPA (Title 7, United States Code, 136 through 136y) approved; synthetically color dyed to permit visual identification of treated soil.

B. Diluent: Recommended by toxicant manufacturer.

C. Manufacturers:
   1. Bayer Environmental Science Corp; Premise Pro: www.backedbybayer.com/pest-management.
   2. FMC Professional Solutions; Talstar Professional: www.fmcprosolutions.com.
   3. Syngenta Professional Products; Altriset: www.syngentaprofessionalproducts.com.

D. Mixes: Mix toxicant to manufacturer's instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

B. Verify final grading is complete.

3.02 APPLICATION - CHEMICAL TREATMENT

A. Comply with requirements of U.S. EPA and applicable state and local codes.

B. Spray apply toxicant in accordance with manufacturer's instructions.

C. Apply toxicant at following locations:
   1. Under Slabs-on-Grade.
   2. At Both Sides of Foundation Surface.

D. Under slabs, apply toxicant 12 hours prior to installation of vapor barrier.

E. At foundation walls, apply toxicant 12 hours prior to finish grading work outside foundations.

F. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.

G. Re-treat disturbed treated soil with same toxicant as original treatment.

H. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 PROTECTION

A. Do not permit soil grading over treated work.

END OF SECTION

SECTION 31 5000

EXCAVATION SUPPORT AND PROTECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General & Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. All work, installation, procedures, materials, etc. shall be in conformance with the Standard Specifications for Road and Bridge Construction, adopted January 1, 2022, along with Supplemental Specifications and Recurring Special Provisions, adopted January 1, 2022, by the Illinois Department of Transportation (herein referred to as the Standard Specifications) except as modified by this Specification.

1.02 SUMMARY

A. Section includes temporary excavation support and protection systems.

B. Related Sections:

1. Section 312000 – Earth Moving

1.03 FIELD CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by OWNER or others unless permitted under the following conditions and then only after arranging to provide temporary utilities according to requirements indicated:

1. Notify ARCHITECT/ENGINEER and OWNER no fewer than seven days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without OWNER’s written permission.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of the GEOTECHNICAL ENGINEER and represent interpretations of subsoil conditions, tests, and results of analyses conducted by the GEOTECHNICAL ENGINEER. OWNER will not be responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection according to the performance requirements.
2. The geotechnical report is included elsewhere in the Project Manual.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Provide, design, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.

1. CONTRACTOR Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified licensed structural engineer in the State of IL.
2. Prevent surface water from entering excavations by grading, dikes, or other means.
3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
4. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and slopes and to ensure that damage to permanent structures is prevented.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
   1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from OWNER and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that construction and finishing of other work is not impeded.

3.02 FIELD QUALITY CONTROL

A. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.

B. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.03 REMOVAL AND REPAIRS

A. Remove excavation support/protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.
   1. Fill voids immediately with backfill compacted to density specified in Earth Moving Section.
   2. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION

SECTION 32 1123

AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 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. All work, installation, procedures, materials, etc. shall be in conformance with the Standard Specifications for Road and Bridge Construction, adopted January 1, 2022, along with Supplemental Specifications and Recurring Special Provisions, adopted January 1, 2022, by the Illinois Department of Transportation (herein referred to as the Standard Specifications) except as modified by this Specification.

1.02 SUMMARY

A. This section includes the following:

1. Aggregate material requirements for base courses.

1.03 DEFINITIONS

A. Base Course: Layer placed between the subgrade and paving materials.

B. Geotechnical Testing Agency: Individual or company who will be providing geotechnical testing responsibilities for this project.

C. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

1.04 SUBMITTALS

A. Material Test Certifications: Written documentation from the manufacturing source certifying that each specified aggregate meets IDOT requirements.

Test Reports: From the Geotechnical Testing Agency, indicating and interpreting test results for compliance with the following requirements indicated: (Geotechnical Testing Agency shall submit test reports to the Owner's Representative, Civil Engineer and Contractor no more than 24 hours after the test results are known.)

1. Test Reports as indicated in "FIELD QUALITY CONTROL" section of this specification.

1.05 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: The Contractor shall engage an independent testing agency qualified according to ASTM E 329 to conduct soil materials, rock-definition testing and compaction testing as documented according to ASTM D 3740 and ASTM E 548.

PART 2 PRODUCTS

2.01 MATERIALS

A. Base Courses: CA6 aggregate base conforming to IDOT standards.

1. IDOT Granular Base Material: The aggregate shall be in accordance with the following gradation requirements:

Sieve	Percent by Weight
Passing 1½ inch	100
Passing 1 inch	90-100
Passing ½ inch	60-90
Passing No. 4	30-56
Passing No. 16	10-40
Passing No. 200	4-12

PART 3 EXECUTION

3.01 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.
B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
C. Verify that all erosion control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust has been installed properly. Refer to plan drawings and erosion control details in the construction drawings for specifics on location and placement of erosion control measures.

3.02 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
    1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
    2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.03 EXCAVATION

A. Excavation for pavement areas: Excavate areas under pavement roadway areas to indicated subgrade elevations as shown on the plan drawings and detail sheet of the construction drawings.

3.04 STORAGE OF SOIL MATERIALS

A. Aggregates shall be produced, handled and stockpiled to minimize segregation, degradation and contamination. Regardless of the method of storage and handling, all aggregate that is segregated, degraded or contaminated to the extent that the aggregate does not meet specifications, will be considered unacceptable.
B. Stockpile aggregate materials away from edges of construction. Do not store within drip line of remaining trees.

3.05 COMPACTION

A. Only place aggregate bases on prepared subgrades.
B. Place aggregate base materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
C. Compact each layer of aggregate base material to not less than the following percentages of maximum dry density as determined by the Standard Proctor test, according to ASTM D 698.
1. Compact each layer of aggregate material by compacting to 100 percent of the maximum dry unit weight according to ASTM D 698 (Standard Proctor Test).

3.06 FIELD QUALITY CONTROL

A. Aggregate Base: The Geotechnical Testing Agency shall test compaction of the aggregate base in place, according to ASTM D 698 (Standard Proctor Test). Tests will be performed at the following locations and frequencies:
    1. Building Slabs and Pavement Areas: At least one test for every 2000 sq. ft. but in no case fewer than 3 tests.
B. When the Geotechnical Testing Agency reports that aggregate bases have not achieved degree of compaction specified, remove and replace aggregates, as required. Recompact and retest until specified compaction is obtained. The Owner is not responsible for any costs associated with retesting previously failed areas.

C. The Contractor is responsible for limiting the amount of heavy vehicle construction traffic on aggregate bases. Contractor shall be responsible for rebuilding damaged aggregate bases as a result of excessive construction traffic at no additional cost to the Owner.

3.07 PROTECTION

A. Protect newly placed aggregate bases from freezing and erosion. Keep free of trash and debris.

3.08 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal:
   1. Dispose of waste material and debris legally off Owner's property.

END OF SECTION

SECTION 32 1313

CONCRETE PAVING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. All work, installation, procedures, materials, etc. shall be in conformance with the Standard Specifications for Road and Bridge Construction, adopted January 1, 2022, along with Supplemental Specifications and Recurring Special Provisions, adopted January 1, 2022, by the Illinois Department of Transportation (herein referred to as the Standard Specifications) except as modified by this Specification.

1.02 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:
   1. Pavement
   2. Walkways and Door Stoops
   3. Pavement Markings
   4. Site Lighting, Bollards, and misc. foundations.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.04 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
   1. Cementitious materials and aggregates.
   2. Steel reinforcement and reinforcement accessories.
   3. Admixtures.
   4. Curing compounds.
   5. Joint fillers

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed pavement work 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.

B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
   1. Manufacturer must be IDOT certified.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

E. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.
G. Pre-installation Conference: Conduct conference at Project site to review construction drawings, specifications, and project schedule.
    1. Before submitting design mixes, review concrete pavement mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with concrete pavement to attend, including the following:
        a. Contractor's superintendent.
        b. Independent testing agency responsible for concrete design mixes.
        c. Ready-mix concrete producer.
        d. Concrete subcontractor.

1.06 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic at all times.

1.07 WARRANTY

A. The CONTRACTOR shall warranty all construction materials and workmanship associated with the pavements for this CONTRACT to be free from defects for a period of one (1) year from the date of final acceptance by the OWNER. Any cracks, flaws, etc. in the paving or markings shall be sealed by the CONTRACTOR at his/her own expense during the one (1) year guarantee period.

PART 2 PRODUCTS

2.01 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
    1. Use flexible or curved forms for curves of a radius 100 feet or less.
B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.02 STEEL REINFORCEMENT

A. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed.
B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
    1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.03 CONCRETE MATERIALS

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.
B. Portland Cement: ASTM C 150, Type I or II.
    1. Fly Ash: ASTM C 618, Class F or C, maximum 15%.
C. Course Aggregate: standard cast-in-place concrete applications: ASTM C 33, uniformly graded, limestone, from a single source as follows:
    1. Maximum Aggregate Size: 3/4 inch nominal.
    2. Do not use coarse aggregates containing substances that cause spalling.
D. Fine Aggregate: ASTM C 33, size 67, uniformly graded, from a single local source, with fine aggregate as follows:
    1. Concrete Sand.
    2. Do not use fine aggregate containing substances that cause spalling.
E. Water: ASTM C 94.

2.04 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain no more than 0.1 percent water- soluble

chloride ions by mass of cement and to be compatible with other admixtures.

B. Air-Entraining Admixture: ASTM C 260.

C. The following may be used under various site conditions. Contractor must get permission from the ARCHITECT/ENGINEER to use these admixtures:
   1. Water-Reducing Admixture: ASTM C 494, Type A.
   2. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
   3. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
   4. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.05 AUXILIARY MATERIALS

A. Pavement-Marking Paint shall be in accordance with Section 1095.02 of the IDOT Standard Specifications.
   1. Color: Yellow for parking stripes and fire truck lanes at the garage doors.
   2. Color: Yellow for ADA parking space stripes, crosswalks and accessible parking symbols.

B. Expansion Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork with preinstalled bond breaker and removable top strip.

C. Expansion Joint Sealant: ASTM C 920, pourable, chemically curing elastomeric formulation.

2.06 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.07 CONCRETE MIXES

A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.

C. Proportion mixes to provide concrete with the following properties:
   1. IDOT Class PV, per Std. Spec's., for Vehicular Pavements.
      a. Compressive Strength (14 Days): 3500 psi.
      b. Water-Cementitious Materials Ratio: 0.32 to 0.42.
      c. Slump: 2" to 4".
   2. IDOT Class SI, per Std. Specs's., for Sidewalks, Curb and Gutters, and Light Pole Foundations.
      a. Compressive Strength (14 Days): 3500 psi.
      b. Water-Cementitious Materials Ratio: 0.32 to 0.44.
      c. Slump: 2" to 4".

D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
   1. Fly Ash: 15 percent.
   2. Ground Granulated Blast-Furnace Slag: 50 percent.
   3. Flint and chert: 1 percent by weight of the course aggregate.
   4. Lignite: 0.07 percent by weight of the fine aggregate.

E. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows:
   1. Air Content: 5.0 to 8.0 percent air entrained for 3/4-inch maximum aggregate.

2.08 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.
   1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from

1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Comply with requirements and measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
   1. For mixers of 1 cu. yd. or smaller capacity, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
   2. For mixers of capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
   3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added.

PART 3 EXECUTION

3.01 PREPARATION

A. Proceed with pavement placement only after proper compaction of aggregate bases has been confirmed. Remove loose material from aggregate surface immediately before placing concrete.

3.02 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.03 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.
   1. Apply epoxy repair coating to uncoated or damaged surfaces of epoxy-coated reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

3.04 JOINTS

A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
   1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
   1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
   2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
   3. Provide tie bars at sides of pavement strips where indicated.

4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.05 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.

E. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

F. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

G. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.

H. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

I. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool

concrete is Contractor's option.

2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.
4. As soon as concrete is placed and formed employ moisture retention measures to prevent shrinkage cracking.

3.06 CONCRETE FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power- driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Re-float surface immediately to uniform granular texture.

1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float- finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.07 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

E. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

F. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to 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.

3.08 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel

1/4 inch per 12 inches.

8. Joint Spacing: Minimum=0.8 times width of walk, Maximum=1.2 times width of walk.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.09 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Testing Services: Testing shall be performed according to the following requirements:
   1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
   2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
   3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
   4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive- strength specimens.
   5. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. One specimen shall be tested at 7 days and two specimens at 14 days; one specimen shall be retained in reserve for later testing if required.
   6. When strength of field-cured cylinders is less than 85 percent of companion laboratory- cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
   7. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive
   8. strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi.

C. Test results shall be reported in writing to OWNER’s Representative, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 14 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 14-day tests.

D. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by the OWNER’s Representative. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.10 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 32 9200

TURF AND GRASSES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Seeding at all disturbed site areas not part of planting areas.

1.03 ALTERNATES

A. See Section 012300 – Alternates; for work of this Section affected by alternates.

1.04 INFORMATIONAL SUBMITTALS

A. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by OWNER for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Accompany each delivery of bulk materials with appropriate certificates.

1.07 FIELD CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
   1. Spring Planting: April 1st through May 30th.
   2. Fall Planting: September 1st through October 15th.
   3. Summer Planting: Planting between the above Spring and Fall dates is acceptable only if the Contractor provides a dedicated temporary irrigation system, capable of thoroughly and evenly watering planted areas.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.08 WARRANTY

A. Special Warranty: Installer agrees to repair or replace turf that fail in materials, workmanship, or growth within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by OWNER, or incidents that are beyond Contractor's control.

2. Warranty Period from Date of Substantial Completion:
    a. 12 months following substantial completion plus one additional growing season. If seed does not germinate and develop into a healthy stand of turf, Contractor shall reseed, overseed, or otherwise provide remedial work necessary for successful turf development.

PART 2 PRODUCTS

2.01 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances. Seed shall be true to species and variety and labeled with quantity/quality information listed below. Should the pure live seed be less than required herein, the rate of seed shall be increased to obtain an equal amount of pure live seed per acre.

B. Seed Species:
    1. Quality: State-certified seed of grass species as listed below for solar exposure.
    2. Sun and Partial Shade:
        a. Turf Type Tall Fescue Seed Mix

2.02 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
    1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
    2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
    3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.02 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
    1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
    2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.03 SEEDING

A. All disturbed areas are to be seeded.

B. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
    1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
    2. Do not use wet seed or seed that is moldy or otherwise damaged.
    3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

C. Sow seed at a total rate of 3 to 4 lb/1000 sq. ft.

D. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

E. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
F. Over seed two weeks following original sowing. Apply seed, in the same mixture and by the same method as the original sowing.
G. Apply a third over seeding six weeks after original sowing.
H. Water thoroughly and evenly following each seeding.

3.04 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
   1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
   2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
   3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
   1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
   2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.

3.05 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:
   1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.06 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off OWNER's property.
C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
D. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 32 9200

SECTION 33 3000
SANITARY SEWERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General & Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. All work, installations, procedures, materials, and testing of the work performed under this Section shall conform to the Standard Specifications for Water and Sewer Main Construction in Illinois, 8th edition, 2020 (hereinafter referred to as the Standard Specifications), except as modified by this Specification.

1.02 SUMMARY

A. This work includes the furnishing of all labor, materials, and equipment necessary for the construction of the proposed sanitary sewer improvements in substantial accordance with the Contract Drawings and Specifications. CONTRACTOR shall pay for all permits required under this Specification.

B. Related Sections:
   1. Section 312000 – Earth Moving
   2. Section 033000 – Cast In Place Concrete

1.03 SUBMITTALS

A. The CONTRACTOR shall submit to the ARCHITECT/ENGINEER four (4) copies of manufacturer's information for the sanitary sewer pipe, cleanouts, and appurtenances to be utilized for the construction of this project. The CONTRACTOR shall submit to the ARCHITECT/ENGINEER four (4) copies of the test results as required by this Specification.

B. The Sewer District (Authority Having Jurisdiction - AHJ) shall be notified five (5) days prior to the start of construction, testing, and date of completion.

C. Within 45 days after completion of the sanitary sewers, the CONTRACTOR shall furnish the AHJ with a set of As-Built Sewer Plans and Test Results. The As-Built plans shall include the following:
   1. A utility site plan drawn to scale.
   2. Size and slope of the sanitary sewers, distance between manholes, manhole invert and rim elevations and the type of pipe material installed.
   3. Service lines shall be shown with accurate location of tees, lengths of laterals, approximate depth to the end of the lateral and accurate distances to manholes.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe or fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer’s rigging instruction.

1.05 FIELD CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by OWNER or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
   1. Notify OWNER no less than one week in advance of proposed interruption of service.

1.06 QUALITY ASSURANCE

A. Contractors Organization
   1. The CONTRACTOR shall have a competent supervisor on the site during the progress of the work who shall act for the CONTRACTOR in all matters concerning the work. He shall have the authority to receive directions and to act upon directions from the OWNER.
   2. The testing and installation of the sanitary sewers and appurtenances shall be made under the supervision of a Professional ENGINEER, licensed in the State of Illinois.

1.07 WARRANTY

A. The CONTRACTOR shall warrant all construction associated with this Contract to be free from defects for a period of one (1) year from the date of final acceptance by the OWNER.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sanitary Sewer Manholes
   1. Manholes shall comply with the minimum standards in the Standard Specifications for Water & Sewer Main Construction in Illinois and shall be a minimum of 48-inches in diameter. See Drawing for standard manhole and for plan view of manhole.
   2. Drop Connections: Drop manhole installations shall be installed on the outside of the manhole and shall comply with appropriate provisions and details in the Standard Specifications for Water & Sewer Main Construction in Illinois. See Drawing for standard drop connection detail.
   3. Abandoned manholes shall be removed to 2-feet below grade and filled with washed sand or gravel. All openings in abandoned manholes shall be plugged with concrete and brick.
   4. Maximum spacing between manholes shall be approximately 300 feet.

B. Thermoplastic Sanitary Sewer Pipe
   1. Except where otherwise noted, sanitary sewer pipe shall be P.V.C. pipe in conformance with ASTM D-3034 SDR-26, type PSM for sizes 4"-15". Wye fittings shall be provided in the sanitary sewer main for service sewer connections.

C. Sanitary Sewer Joints
   1. P.V.C. sanitary sewer pipe joints shall be in conformance with ASTM D-3212 with the elastomeric gasket glued in place.

D. Sanitary Sewer Gaskets
   1. Gaskets shall be molded from a high grade, properly vulcanized elastomeric compound consisting of either a basic natural or synthetic rubber.

E. Lubricant
   1. Lubricant shall be suitable for lubricating the joint component. It shall have no deteriorating effect on the gasket or pipe material.

F. Bedding for Sanitary Sewer Pipe
   1. The CONTRACTOR shall provide bedding for the sanitary sewer pipe in accordance with ASTM D-2321. The embedment material shall be Class 1 angular 6 to 40 mm (1/4 to 1/2 inches) graded stone. The bedding shall have a minimum thickness beneath the pipe of six (6) inches and shall extend up the sides of the pipe to the horizontal centerline. Backfill from pipe horizontal centerline to a level not less than twelve (12) inches above the top of the line shall be Class 1 material conforming to ASTM D-2321.

G. Cleanouts
   1. Cleanouts shall be constructed of P.V.C. pipe and shall be sealed with a removable screwtype fitting to allow future cleaning of the sanitary sewer main. All cleanouts shall be protected with a frame and a closed lid such as Neenah R-1976 as manufactured by the Neenah Foundry Company or equivalent frame which shall perform the same function.

H. Connections
   1. Connections of pipe at the building and existing sanitary sewer main shall be made with neoprene gaskets conforming to the outside diameter of the pipe being connected. The neoprene gasket shall be secured to the pipe utilizing stainless steel connection bands.

2.02 WARNING TAPE

A. Metallic Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters "CAUTION SEWER LINE BURIED BELOW."

PART 3 EXECUTION

3.01 INSTALLATION OF SANITARY SEWER

A. All water and sanitary/storm/combined sewer separation (horizontal and vertical) shall meet requirements set forth in “Standard Specifications for Water and Sewer Construction in Illinois, 8th Edition, 2020” in Section 41-2.01.

B. All sanitary sewer lines shall be installed as per the Standard Specifications using a laser provided by the CONTRACTOR capable of aligning the sanitary sewer to the proper grades as specified on the Contract Drawings.

C. Contractor shall verify both upstream and downstream connections / elevations prior to placement of pipe.

3.02 TESTING

A. Infiltration of ground water into the completed system shall under no circumstances exceed 200 gallons per inch of pipe diameter per mile per day. This requirement applies to laterals, sewer mains and manholes.

B. Infiltration/ Exfiltration Testing (Done prior to connection permit being issued)

1. Testing of sanitary sewers, laterals, and manholes for acceptability shall be conducted by the CONTRACTOR by the exfiltration of air method, infiltration of water method, or exfiltration of water method as specified in the Standard Specification for Water and Sewer Construction in Illinois, current edition.
2. Air testing shall be performed by the CONTRACTOR and shall be undertaken in accordance with the latest ASTM standard practice for testing sewer lines by low pressure air test method for the appropriate pipe material. The test results shall not be less than the time per inch of pipe diameter per length of sewer pipe as specified in the appropriate testing standard or the manufacturer’s recommended limits, whichever is more stringent. All testing shall be in conformance with the Standard Specifications for Water and Sewer Construction in Illinois, current edition.

C. Mandrel Testing (Done prior to connection permit being issued)

1. Testing of sanitary sewers for acceptability shall be conducted by the CONTRACTOR by pulling a go - no go mandrel through the pipe from manhole to manhole as per section 170.00 of the Sanitary Sewer Standard of the Urbana & Champaign Sanitary District.
2. The outside diameter of the test mandrel shall be 1 inch less than the inside diameter of the pipe being tested.

3.03 WYE FITTINGS

A. The CONTRACTOR shall maintain a log of all wye fittings which shall record the upstream distance of the wye from the downstream manhole, the distance the service lateral has been extended from the main and the depth below finished ground elevation at the terminus point of the lateral. A legible and reproducible copy of such log shall be turned over to the OWNER and ARCHITECT/ENGINEER at the completion of the project. Wyes shall be eight (8) inches inside diameter. All fittings shall be capped with a plug as the same material as the sewer pipe and shall be capable of withstanding air testing of the sanitary sewer system.

3.04 CLEAN-OUTS

A. Clean-outs shall be constructed of eight (8) inch D-3034 DR 35 polyvinyl chloride pipe as detailed on the Contract Drawings and shall terminated at a point five (5) feet from the proposed buildings unless otherwise noted on the drawings.

3.05 BACKFILL IN STRUCTURAL AREAS

A. Backfill under pavement, parking, sidewalk, or similar structural areas shall be accomplished utilizing CA 6 Type A granular aggregate from the point of initial pipe backfill to the subgrade.

3.06 CLEANING

A. Clean dirt and superfluous material from interior of piping. Flush with potable water.

END OF SECTION

3.07 TELEVISING

A. All newly constructed public and private sanitary sewers 8" or larger shall be inspected by the CONTRACTOR using closed circuit television. Any defects discovered during televised inspection shall be corrected at no cost to the Owner, City, or Sewer District. After the correction of defects has been completed, affected sewer sections shall be re-televised at no additional cost. An electronic copy of the internal pipe televising inspection shall be provided to the owner, City, and Sewer District prior to final acceptance of the sewers.

SECTION 334100

STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions Division 1 Specification Sections, apply to this Section.

B. All work shall be done in accordance with the Standard Specifications for Water and Sewer Main Construction in Illinois, current edition and with the IDOT Standard Specifications.

1.02 SUMMARY

A. This Section includes storm drainage outside the building.

1.03 DEFINITIONS

A. PVC: Polyvinyl chloride.

1.04 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.05 SUBMITTALS

A. Product Data: For the following:
   1. Storm piping.

B. Shop Drawings: Include plans, elevations, details, and attachments for the following:
   1. Inlet/manhole structures, including frames, covers, and grates.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

1.07 PROJECT CONDITIONS

A. Site Information: Verify all existing utility locations.

B. Locate existing storm sewer piping and structures that has been closed or abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to the Owner's Representative.
   1. Do not proceed with utility interruptions without Owner's Representative written permission.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Products and Manufacturers: Subject to compliance with Owner's requirements, and product submittal review and approval by the Engineer.

2.02 PIPES AND FITTINGS

A. PVC Sewer Pipe and Fittings: All piping shall be 6 inches in diameter or larger:
   1. 4" – 15" PVC Sewer Pipe and Fittings, ASTM D 3034, SDR 26, for solvent-cemented or gasketed joints.
      a. Gaskets: ASTM F 477, elastomeric seals.

PART 3 EXECUTION

3.01 GENERAL

A. Follow all IDOT standards for storm sewer materials and construction, unless directed otherwise by the project documents.

B. The Contractor shall adhere to all applicable OSHA construction regulations, as well as adherence to confined space safety, if applicable.

3.02 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section "Excavation and Fill"

3.03 IDENTIFICATION

A. Install warning tape above piping and structures during backfilling. Locate below finished grade, directly over piping. See Section "Excavation and Fill" for underground warning tapes.

3.04 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and sewer profiles indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout takes design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

C. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
2. Install piping with 36-inch minimum cover unless otherwise indicated.

3.05 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. PVC Sewer Pipe and Fittings: As follows:

1. Install according to pipe manufacturers written specifications.

C. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.06 MANHOLE AND INLET INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Form continuous concrete channels and benches between inlets and outlet.

C. Set tops of frames, cover and grates flush with finished surface for manholes and inlets that occur in pavements, and 2 inches above finished grade surface for lawns, unless otherwise indicated.

D. Install precast concrete manhole sections with gaskets according to ASTM C 891.

3.07 TAP CONNECTIONS

A. Make connections to existing piping and underground structures as required.

B. Make branch connections to underground structures by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated.

1. Use concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

C. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.08 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports as required by MSD.

1. Testing agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from specified requirements.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

C. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
   1. In large, accessible piping, brushes and brooms may be used for cleaning.
   2. Place plug in end of incomplete piping at end of day and when work stops.
   3. Flush piping between manholes and other structures to remove collected debris.

D. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
   1. Submit separate reports for each system inspection.
   2. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
   1. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   2. Reinspect and repeat procedure until results are satisfactory.

E. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems according to authorities having jurisdiction.
   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
   4. Submit separate reports for each test.
   5. Leaks and loss in test pressure constitute defects that must be repaired.
   6. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

F. Submit all test reports within 24 hours of the testing to the authority having jurisdiction, Owner’s Representative and Architect.

END OF SECTION

rev, 08/1/2022

PHASE	Milestone Dates	Topic
Programming	05.06.2022	Final Programming meeting
Schematic Design	05.26.2022	Final Submission- Schematic Design: Floor Plans and Prelim budget update
Design Development	08.12.2022	Final Submission- Design Development: sent to estimator for budget update
Construction Documents	10.04.2022	Construction Documents 95% set for Facilities Committee and budget update
Construction Documents	10.07.2022	Construction Documents 100% set
Bidding	10.13.2022	Out to Bid: 10/13/2022
Bidding	10.20.2022	Site walk with Bidders
Bidding	11.10.2022	Bid opening
Contracts	11.17.2022	Board Meeting
Construction	12.2022	Start Construction
Construction	1.2024	Substantial Completion

RESOLUTION NO. 2022 - ___

RESOLUTION AUTHORIZING THE CHAMPAIGN COUNTY EXECUTIVE TO EXECUTE AN AGREEMENT BETWEEN THE COUNTY AND THE EAST CENTRAL ILLINOIS BUILDING & CONSTRUCTION TRADES COUNCIL REGARDING A PROJECT LABOR AGREEMENT FOR THE _____PROJECT

WHEREAS, the Champaign County Board _____
_____
_____
through an upcoming construction and/or renovation project.

WHEREAS, the County Board anticipates that a Request for Proposals (RFP) will be issued for this project to elicit bids in a competitive selection process.

WHEREAS, the County provide vital services to the citizens of Champaign County that require the timely completion this project within precise and limited time parameters; and strikes and other work stoppages could delay the completion of certain projects, disadvantaging the County's residents.

WHEREAS, skilled craftsmen are needed by the County to achieve the quality of workmanship essential to meeting public expectations and interests.

WHEREAS, the County Board believes it to be in County's interest to promote the efficiency of construction operations and provide for peaceful settlement of labor disputes without strikes or lockouts, thereby promoting the public interest in assuring the timely and economical completion of the work.

WHEREAS, the County Board intends to set standard working conditions for the efficient performance of work at the County, to establish and maintain harmonious relations between all parties to County contracts, to secure optimum productivity and to eliminate strikes, lockouts, or delays in the performance of work at the County.

WHEREAS, it is the policy of Champaign County to encourage and require equal opportunity in employment for all persons, and to promote workplace diversity, and to prohibit discrimination in employment.

NOW THEREFORE, BE IT RESOLVED that the Champaign County Board hereby authorizes the Champaign County Executive to execute the attached Agreement, regarding the attached Project Labor Agreement (PLA), with the East Central Illinois Building & Construction Trades Council (ECIBCTC).

BE IT FURTHER RESOLVED that in the event ECIBCTC agrees to the attached Agreement in a timely manner prior to the issuance of the RFP, the County Executive shall include the attached PLA and attached PLA Contract Terms as part of the County's requirements in the initial RFP to be issued for the _____Project, and shall negotiate with the selected bidder to the RFP to include the attached PLA-Related Contract Terms, or terms substantially similar thereto, in any final award of contract.

BE IT FURTHER RESOLVED that in the event no qualified bidders bid on the initial RFP for said project, or portion thereof, the County Executive may request new proposals without including the PLA.

BE IT FURTHER RESOLVED that in order that the County Executive have the power to see that this resolution of the County Board is faithfully executed, the County Executive shall have the duties and powers detailed in Article 14 of the attached PLA regarding Workforce Diversity and Equal Opportunity in Employment, including but not limited to: determining the sufficiency of good faith efforts; establishing narrowly tailored and flexible female and minority contract participation goals; granting or denying waivers; monitoring compliance; approving affirmative action and utilization plans; and, if necessary, invoking any of the sanctions provided for under the terms of the agreement with the contracting entity.

PRESENTED, ADOPTED, APPROVED, AND RECORDED
this ____ day of _____ A.D. 2022

_____
Kyle Patterson, Chair
Champaign County Board

Recorded
& Attest: _____

Aaron Ammons, County Clerk
and ex-officio Clerk of the
Champaign County Board

Date: _____

Approved:_____

Darlene A. Kloeppel, County Executive

Date: _____

Attachments: Agreement between ECIBCTC and Champaign County, Illinois (proposed)
PLA-Related Contract Terms (proposed)
ECIBCTC Project Labor Agreement (proposed)

AGREEMENT
BETWEEN THE
EAST CENTRAL ILLINOIS BUILDING & CONSTRUCTION TRADES COUNCIL
AND
CHAMPAIGN COUNTY, ILLINOIS

1. This Agreement is entered into to facilitate the timely completion of a specific upcoming construction and renovation project at Champaign County ("the County"), namely the project commonly referred to as the _____Project, RFP #_____ (the "Project").

2. The County provides vital services to the citizens of Champaign County that require the timely completion of projects within precise and limited time parameters. Strikes and other work stoppages could delay the completion of certain projects, disadvantaging the County's residents. Skilled craftsmen are needed by the County to achieve the quality of workmanship essential to meeting public expectations and interests. Furthermore, the parties to this Agreement believe it to be in their mutual interest to promote the efficiency of construction operations and provide for peaceful settlement of labor disputes without strikes or lockouts, thereby promoting the public interest in assuring the timely and economical completion of the work. It is also the intent of the parties to set standard working conditions for the efficient performance of work at the County, to establish and maintain harmonious relations between all parties to the Agreement, to secure optimum productivity and to eliminate strikes, lockouts, or delays in the performance of work at the County.

3. The County agrees to include the attached Project Labor Agreement ("PLA"), or mutually agreed successor versions, as part of the Request for Proposals ("RFP") for the Project, which is a construction and/or renovation project estimated to cost Thirty Thousand Dollars ($30,000.00) or more as determined by the County.

4. Any firm, union affiliated or not, may bid on the Project pursuant to the RFP process. To be awarded a contract, successful bidders must become a party to the PLA or a substantially similar successor version as may be reasonably negotiated and mutually agreed upon between the bidder and the County. This Agreement applies only to this Project.

5. The East Central Illinois Building & Construction Trades Council ("the ECIBCTC"), its member unions, agents, affiliates and surrogates agree to not stop, delay, interrupt, strike, picket, harass or interfere in any way with construction projects, contractors, or employees engaged in County projects covered by a PLA. Any interference, whether lawful or not, shall terminate this Agreement.

6. In the event that no qualified bidders bid on a project, or portion thereof, the County reserves the right to request new proposals without including the PLA.

7. In the event that there is insufficient labor available through ECIBCTC member Unions to staff construction projects, the County reserves the right to exclude the PLA as a requirement from any or all solicitations for construction until such time as sufficient labor is made available. The County will make efforts to consult with the ECIBCTC prior to excluding the PLA. The ECIBCTC will be provided an opportunity to remedy the labor insufficiency prior to the PLA being excluded. The County reserves the sole right to determine the sufficiency of available labor. Nothing in this Agreement shall preclude the County from utilizing or assigning County employees to perform assigned work.

8. All parties agree to cooperate to promote a diverse workforce and equal opportunity in employment, as detailed in Article 14 of the attached PLA.

9. The term of this Agreement is two years, beginning _____ , 2022, and ending on _____ , 2024, unless extended by mutual agreement as detailed in paragraph 10.

10. Neither party to this Agreement shall be obligated to enter into any negotiations for the renewal or extension of this Agreement. If either party desires to renew or extend the Agreement, such party will notify the other party in writing at least ninety (90) days prior to the expiration date.

IN WITNESS WHEREOF, the East Central Illinois Building & Construction Trades Council and Champaign County have caused this Agreement to be executed in their respective capacities effective this _____ day of _____, 2022.

Champaign County (County)

_____
Darlene A. Kloeppel,
County Executive

Attest: _____
Aaron Ammons, County Clerk
And *Ex-Officio* Clerk of the
Champaign County Board

East Central Illinois Building & Construction Trades Council (ECIBCTC)

_____
President of ECIBCTC

_____
Vice President of ECIBCTC

_____
Secretary/Treasurer of ECIBCTC

Attachment to Champaign County Board Resolution No. 2022 - ____

RE: Project RFP / PLA

PLA-RELATED CONTRACT TERMS

Equal Opportunity in Employment & Project Labor Agreement Provision

For the purposes of this provision, "contracting entity" means the legal entity that has signed a contract to provide services or perform work or to provide personal property or a combination thereof to or on behalf of the County. The words used herein and the requirements shall be interpreted in accordance with and have the meaning ascribed to them as set forth in Article 14 of the Project Labor Agreement.

(1) *Non-discrimination pledge.* The contracting entity shall not discriminate against any employee during the course of employment or application for employment on the basis of race, color, religion, national origin, ancestry, sex (including pregnancy), gender identity or expression, age, citizenship status, marital status, sexual orientation, genetic information, order of protection status, arrest record, military status, physical or mental disability unrelated to an individual's ability to perform the essential functions of their job with or without reasonable accommodations, or unfavorable discharge from the military.

(2) The contracting entity shall make good faith efforts in accordance with its affirmative action plan and utilization plan, if one is required to be submitted to and approved by the County, to achieve female and minority participation goals by hiring and partnering with WBEs, MBEs, and female and minority workers. Good faith efforts are defined in Article 14 of the Project Labor Agreement regarding this project.

(3) *Notices.* The contracting entity shall post notices regarding non-discrimination in conspicuous places available to employees and applicants for employment. The notices shall be provided by the County, setting forth the provisions of the non-discrimination pledge; however, the contracting entity may post other notices of similar character supplied by another governmental agency in lieu of the County's notice.

(4) *Employment relations.* The contracting entity shall send to each labor union, employment service agency, or representative of workers with which the contracting entity has a collective bargaining agreement or other contract or understanding, a copy of the contracting entity's notice regarding the non-discrimination pledge.

(5) *Solicitation and ads for employment.* The contracting entity shall, in all solicitations and advertisements for employees placed by or on behalf of the contracting entity, state "This is an Equal Opportunity Employer."

(6) *Access to books.* The contracting entity shall permit access to all books, records and accounts pertaining to its employment practices by the County Executive or the County Executive's designee for purposes of investigation to ascertain compliance with these provisions and the Project Labor Agreement.

(7) *Reports.* The contracting entity shall provide periodic compliance reports to the County Executive, upon request. Such reports shall be within the time and in the manner proscribed by the County and describe efforts made to comply with the provisions of the Project Labor Agreement.

(8) *Remedies.* In the event that any contracting entity fails to comply with the above subsections, or fails to comply with or make good faith efforts to comply with its affirmative action plan, utilization plan, or any provision of county, state or federal law relating to human rights, after the County has provided written notice to the contracting entity of such failure to comply and provided the contracting entity with an opportunity to cure the non-compliance, then the County, at its option, may declare the contracting entity to be in default of this agreement and take, without election, any or all of the following actions:

(i) Cancel, terminate or suspend the contract in whole or in part;

(ii) Declare the contracting entity ineligible for further contracts for up to one calendar year;

(iii) Recover from the contracting entity by set-off against the unpaid portion of the contract price, or otherwise recover money due to the contracting entity pursuant to the contract, the sum of fifty dollars ($50.00) per day, as liquidated damages and not as a penalty, for each day after the date of the notice that the contracting entity fails to comply with these provisions of the contract, as determined by the County Executive, the said sum being fixed and agreed upon by and between the contracting entity and the County because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages which the County would sustain in the event of such breach of contract, and said amount is agreed to be the amount of monetary damages which the County would sustain;

(iv) Seek other contractual remedies or sanctions allowable by law.

(9) Construction contractors shall automatically include the provisions of the foregoing paragraphs in every construction subcontract so that the provisions will be binding upon each construction subcontractor.

East Central Illinois Building & Construction Trades Council

Project Labor Agreement

This Agreement is entered into this _____day of _____, 2022, by and between

_____and the East Central Illinois Building and Construction Trades Council (ECIBCTC) for and on behalf of its affiliates, individually and collectively, hereinafter referred to as the "Union". This Agreement shall apply to work performed by the Employer (Champaign County) and its Contractors and Subcontractors on

Construction known as the _____, hereinafter referred to as the "Project".

Article 1 - Intent and Purposes

1.1 It is mutually understood that the following terms and conditions relating to employment of workmen covered by this Agreement have been written in order to promote efficiency of construction operations and provide for peaceful settlement of labor disputes without strikes or lockouts, thereby promoting the public interest in assuring the timely and economical completion of the work. It is also the intent of the parties to set out standard working conditions for the efficient prosecution of said construction work, herein to establish and maintain harmonious relations between all parties of the Agreement, to secure optimum productivity and to eliminate strikes, lockout, or delays in the prosecution of the work.

(a) Therefore, the following provisions will be binding upon _____ and all its sub-contractors (herein jointly referred to as "Contractor"), who shall be required to sign the Participation Agreement, attached hereto as Exhibit A, and the Unions during the term of this Agreement and any renewal thereafter. The Unions hereby consent to apply the terms and conditions of this Project Agreement to said sub-contractors upon their signing the Participation Agreement. It is understood that each sub-contractor will be considered and accepted by the Unions as a separate employer for the purposes of collective bargaining. It is further agreed that the employees working under this Agreement shall constitute a bargaining unit separate and distinct from all others. This agreement may be modified by mutual consent in writing by the parties' signatory hereto.

(b) Nothing in this Agreement shall preclude the County from utilizing or assigning County employees to perform assigned work.

1.2 The Contractor agrees to be bound by the terms of the applicable Collective Bargaining Agreements and amendments thereto of the affiliates of the East Central Illinois Building and Construction Trades Council and the applicable employers association, if any. The applicable Collective Bargaining Agreement is that which predominates in Champaign County for the particular work performed by the Contractor. Such agreements are incorporated herein by reference, except that the work of the International Union of Elevator Constructors on this Project shall be performed under the terms of its National Agreements, with the exception of Article XI, XII, and XIII of this Project Labor Agreement, which shall apply to work. It is mutually understood that where the provisions of this Agreement are at variance with any other agreement between the Contractor and the Union, the language of this Agreement shall prevail. In order to comply with the requirements of the various fringe benefit funds to which the

Contractor is to contribute, the Contractor shall sign the applicable participation agreements when necessary.

1.3 The Contractor and the Union agree that should the collective Bargaining Agreement (CBA) of any ECIBCTC affiliate signatory to this Agreement will 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 retroactively is agreed upon by both bargaining parties.

Article 2 - Recognition

2.1 The Contractor recognizes the ECIBCTC and the signatory affiliates as the sole and exclusive bargaining representatives for its craft employees employed on the jobsite. ECIBCTC affiliates signatory to this Agreement will have recognition on the project for their craft.

Article 3 - 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, the County, ECIBCTC representatives, and all signatory parties prior to the start of any work on the project.

3.2 Representatives of the Contractor, the County, or the ECIBCTC may at any time require a meeting to review the operation of this Agreement. Said meeting shall take place within one week of the written request. 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 ECIBCTC no less than two days prior to these meetings, a job status report, planned activities for the next 30 day period, actual number 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.

3.4 ECIBCTC shall supply a Union Contact List, attached hereto as Exhibit B, and shall provide an updated Union Contact List to both the Contractor and the County within one week of any change to the information therein.

3.5 The Contractor shall supply the County with a fully signed copy of this Agreement immediately after its execution. The Contractor shall have a continuing duty to promptly supply the County with complete copies of all signed Participation Agreements.

Article 4 - Hours of Work Overtime Shifts and 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. Changes in the standard work day and week must be requested in writing and approved by the County. 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 crafts involved and the ECIBCTC 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 workday of eight (8) hours, Monday through Friday and all the time on Saturday shall be paid in accordance with each craft's current Collective Bargaining Agreement. All time on Sundays and Holidays shall be paid for at the rate of double time. Fringe benefit payments for all overtime work shall be paid in accordance with each craft's Current Collective Bargaining Agreement.

4.3 Shifts may be established when considered necessary by the Contractor. Shift pay shall be in accordance with each craft's current Collective Bargaining Agreement. Shifts when established shall continue for a minimum of five (5) consecutive days. Changes in shift must be requested in writing and approved by the County.

4.4 Recognized Holidays shall be as follows: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, the day after 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 has been given by the Business Manager.

Article 5 - 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 6 - 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.

Article 7 - General Working Conditions

7.1 Employment begins and ends at the project site.

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 days work for a fair days pay.

7.3 The Contractor may utilize brassing, time clocks 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 or restrictions on the full use of tools or equipment. Craftsmen using tools shall perform any work of the trades 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 foremen'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.

7.7 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.

7.8 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. These personnel may make modifications and final alignment which may be necessary prior to and during the start-up procedure in order to protect factory warranties.

7.9 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 ECIBCTC prior to any involvement on the project by these personnel. The Contractor will inform the ECIBCTC 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.

7.10 Equipment or material delivered to the job site will be unloaded promptly without regard to jurisdictional disputes which will be handled as per the provisions of this Agreement. The Contractor will supply ECIBCTC and affiliated unions with delivery schedules, allowing as much time as possible to ensure the appropriate crafts will be available to unload the materials or equipment.

Article 8 - Safety

8.1 The employees covered by 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. 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 ECIBCTC or any of its affiliates liable to any employees or to other persons in the event that injury or accident occurs.

Article 9 - Subcontracting

9.1 The Project Contractor agrees 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. The furnishing of materials, supplies or equipment and the delivery thereof shall in no case be considered subcontracting, with the exception of ready mix, aggregate, asphalts, brick, block, drywall, and trash removal.

Article 10 - Union Representation

10.1 Authorized representatives of the ECIBCTC and its signatory 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 ECIBCTC affiliate which is a party to this Agreement 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 11 - Work Stoppages and Lockouts

11.1 During the term of this Agreement there shall be no strikes, picketing, work stoppages, slowdowns or other disruptive activity for any reason by the ECIBCTC, its affiliates or by any employee and there shall be no lockout by the Contractor. Failure of any Union or employee to cross any picket line established at the project site is a violation of this Article.

11.2 The ECIBCTC and its affiliates shall not sanction, aid or abet, encourage or continue any work stoppages, 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 Union will take the necessary action to end such prohibited activities.

11.3 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.

11.4 Neither the ECIBCTC nor its affiliates shall be liable for acts of employees for which it has no responsibility. The principal officer or officers of the ECIBCTC will immediately instruct order and use the best efforts of his office to cause the affiliated union or unions to cease any violations of this Article. The ECIBCTC in its compliance with this obligation shall not be liable for unauthorized acts of its affiliates. The principal officer or officers of any involved 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.

11.5 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.

(a) The party invoking this procedure shall notify an individual to be mutually agreed upon; 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 service with delivery confirmation 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 exist but not before twenty-four (24) after the service with delivery confirmation notice to all parties involved as required above.

(c) The Arbitrator shall notify the parties by service with delivery confirmation 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 hereinabove in the following manner. Written notice by service with delivery confirmation 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 this Article, all parties waive the right to a hearing and agree that such proceedings may be ex parte. 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 service with delivery confirmation.

(f) Any rights created by statute 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. In the event that no violation is found, such fees and expenses shall be borne by the moving party.

Article 12 - Disputes and Grievances

12.1 This Agreement is intended to provide close cooperation between management and labor. Each of the Unions will assign a representative to this Project for the purpose of completing the construction of the Project economically, efficiently, continuously, and without interruption, delays, or work stoppages.

12.2 The Contractors, Unions, 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, accept when any craft which has a no strike, no lockout grievance procedure which results in final and binding arbitration, then they shall use their local grievance procedures to settle such disputes.

12.3 Any questions 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 l: (a) When any employee subject to the provisions of the 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.

Step 1: (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: (a) 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 final and binding on all parties, the fee and expenses of the arbitrator shall be borne equally between the Contractor and the involved Local Union(s).

Step 3: (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 the authority to change, amend, add to or detract from any of the provisions of this Agreement.

12.4 The Project Contractor and County shall be notified of all actions at Steps 2 and 3 and shall, upon their request, be permitted to participate in all proceedings at these steps.

Article 13 - Jurisdictional Disputes

13.1 As used in this Agreement, the term "jurisdictional dispute" shall be defined as any dispute, difference or disagreement involving the assignment of particular work to one class or craft of employees rather than to a different class or craft of employees, regardless of that Contractor's contractual relationship to any other employer, contractor or organization on the site.

13.2 It is agreed by and between the parties to this Agreement that any and all jurisdictional disputes shall be resolved in the following manner; each of the steps hereinafter listed shall be initiated by the parties in sequence as set forth:

(a) Negotiation by and between the Local Business Representative of the disputing Unions and Contractor assigning the work within 5 business days. Such negotiation shall be pursued until it is apparent that the dispute cannot be resolved at the local level.

(b) The International Representatives of the disputing Union shall meet on the job site by phone conference, e-mail or fax and attempt to resolve said dispute within 5 business days.

(c) The parties to the Jurisdictional Dispute shall submit the dispute directly to an agreed upon arbitrator after complying with paragraph 13.2(b) above within 5 business days. An arbitrator will be selected from a panel of seven (7) arbitrators supplied through the Federal Mediation and Conciliation Service being selected or rejected one at-a-time by the Unions involved. The arbitrator's decision will be final and legally binding on this project only. Further, the losing party(s) will be responsible for the cost of the Arbitrator.

(d) A jurisdictional dispute may be submitted upon a pre-job assignment.

(e) If any party to the jurisdictional dispute does not fully comply with the steps and time limit with each step, then the party in non-compliance will lose by "automatic default".

(f) Time limits at any step can be extended if all parties to the jurisdiction mutually agree in writing.

(g) All parties to a jurisdictional dispute can mutually agree to waive the time limits in steps 13.2(a) & 13.2(b) and proceed directly to an expedited arbitration hearing.

13.3 The signatory parties to this Agreement agree that 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.

Article 14 – Workforce Diversity & Equal Opportunity in Employment

14.1 It is the policy of Champaign County to encourage and require equal opportunity in employment for all persons, and to promote the full realization of equal employment opportunity through actions by contracting entities who contract with the County. This Article establishes standards and procedures by which Contractors and Unions who perform work on County projects may comply with this stated equal employment opportunity policy.

14.2 Neither the Contractor nor the Union shall discriminate against any employee on the basis of race, color, religion, national origin, ancestry, sex (including pregnancy), gender identity or expression, age, citizenship status, marital status, sexual orientation, genetic information, order of protection status, arrest

record, military status, physical or mental disability unrelated to an individual's ability to perform the essential functions of their job with or without reasonable accommodations, or unfavorable discharge from the military.

14.3 Neither the Contractor nor the Union shall retaliate against a person because they complained about discrimination, filed a charge of discrimination, or participated in an employment discrimination investigation or lawsuit.

14.4 *Definitions*. The following words, terms and phrases, when used in this Article, shall have the meanings ascribed to them in this Article, except where the context clearly indicates a different meaning:

(a) *Champaign Diversity Advancement Program vendor list (CDAP vendor list)* means the certified database maintained by the City of Champaign, used by the County of Champaign pursuant to intergovernmental agreement, of qualified contracting entities that are 51 percent owned and operated by females, minorities, or individuals in other socially disadvantaged groups; or which are local, economically disadvantaged businesses.

(b) *Construction contract* means any contract to which the County is a party for the construction, rehabilitation, alteration, conversion, demolition or repair of buildings, highways or other improvements to real property.

(c) *Construction contractor* means any person who contracts with the County in a construction contract.

(d) *Construction subcontractor* means any person who contracts with a construction contractor in an amount greater than Thirty Thousand Dollars ($30,000.00) for any single construction contract.

(e) *Contracting entity* means any vendor, construction contractor, or construction subcontractor.

(f) *Good faith efforts* are documented actions taken or planned by a contracting entity that are reasonably calculated to meet an established utilization or workforce participation goal or to encourage employment of, partnership with, and development of MBEs, WBEs and female and minority individuals in County projects. A contracting entity making good faith efforts actively and aggressively seeks participation by and partnership with WBEs, MBEs, and women and minority workers. The County will consider the quality, quantity, and consistency of efforts made by a contracting entity in determining whether the contracting entity has acted in good faith.

(g) *Minority Business Enterprise (MBE)* means a business that is at least 51 percent owned by one or more minority persons, or in the case of a corporation, at least 51 percent of the stock in which is owned by one or more than one minority persons; and the management and daily business operations of which are controlled by one or more of the minority individuals who own the business. A business certified as an MBE pursuant to the Champaign Diversity Advancement Program as indicated on the current CDAP vendor list shall be considered an MBE for purposes of this Agreement for such time as said certification remains valid.

(h) *Minority.* For purposes of this Article, "minority" shall be defined by reference to the definition of "minority person" in the Illinois Business Enterprise for Minorities, Females, and Persons with Disabilities Act, 30 ILCS 575/2, as amended.

(i) *Vendor* means persons who sell goods or services to the County in non-construction contracts and any financial depository in which the County deposits funds.

(j) *Woman Business Enterprise (WBE)* means a business that is at least 51 percent owned by one or more women, or, in the case of a corporation, at least 51 percent 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 the business. A business certified as a WBE pursuant to the Champaign Diversity Advancement Program as indicated on the current CDAP vendor list shall be considered a WBE for purposes of this Agreement for such time as said certification remains valid.

14.5 *Good faith efforts.*

(a) All contracting entities performing work on this Project are required to demonstrate good faith efforts in order to be considered a responsive bidder or respondent and throughout the duration of this Project to meet the County's established goals for utilization and employment of MBE and WBE firms and minority and female workers. The County Executive or his or her designee will determine the sufficiency of a contracting entity's good faith efforts. Sufficiency of good faith efforts may vary depending on the type of project, the type of products and/or services to be provided, and the duration of the project.

(b) *Female and Minority Participation Goals.* The County will set aspirational contract participation goals for this Project, except as exempted or waived pursuant to this Article, to assist in inclusion efforts of racial and ethnic minorities, women, and MBEs and WBEs. Contracting entities may meet contract participation goals in two ways: by employing set percentages of female and minority employees ("workforce participation goals"), and/or by assigning set percentages of work on a project to MBEs and WBEs ("utilization goals"). The County will ensure that female and minority participation goals are narrowly tailored in accordance with applicable law, and the County will provide appropriate flexibility to businesses in establishing and providing opportunities for female and minority workers. The County Executive will establish and report goals to the County Board as soon as reasonably practicable upon commencement of the Project, or prior thereto if feasible.

(c) The Union shall make all reasonable efforts to encourage, facilitate, and cooperate with a contracting entity in meeting the County's workforce participation and utilization goals and demonstrating good faith efforts.

(d) The following are minimum requirements a contracting entity must meet to demonstrate good faith efforts:

(1) All contracting entities must submit an Affirmative Action plan as outlined in Article 14.6.

(2) All contracting entities must make all reasonable efforts to contact, negotiate, and partner in good faith with qualified MBE and WBE firms listed on the CDAP

vendor list for potential subcontracting and/or joint venture opportunities and to employ female and minority employees.

(3) All contracting entities must submit a utilization plan that outlines their planned use of qualified MBE and WBE firms as subcontractors or as part of a joint venture, if applicable, and their employment of female and minority employees.

(e) Other evidence of good faith efforts by contracting entities may include, but is not limited to:

(1) Providing job training or direct employment opportunities to increase the utilization of women and minorities on County projects.

(2) Attendance at County-sponsored networking events to increase the utilization of MBEs, WBEs, and female and minority workers.

(3) Providing evidence that the contracting entity has met or exceeded the goals established for this County project related to the utilization of MBE and WBE firms and minority and female workers. Evidence may include payroll records or other documents showing the percentage of minority or female workers employed on a project or the percentage of project hours completed by minority and female workers.

(4) Monetary contributions to training and development funds or organizations dedicated to encouraging MBE and WBE businesses and minority and female workers.

(5) Outreach and recruitment efforts of WBEs and MBEs and female and minority workers.

(6) Packaging requirements, where feasible, into tasks and quantities that encourage maximum participation from MBEs, WBEs, and minority and female workers.

(7) Providing interested and qualified MBEs and WBEs with adequate information about the bidding and request for proposal process, adequate time to respond, and assistance in responding to bid and proposal solicitation.

(8) Assisting interested MBEs and WBEs in obtaining necessary equipment, supplies, and materials to successfully compete for County contracts and subcontracts.

(9) Assisting interested MBEs and WBEs in obtaining bonding, lines of credit, or insurance.

(10) Seeking services from available female and minority community organizations, minority and female contractors' groups, minority and female business assistance offices, and other organizations as appropriate, to provide assistance in recruiting MBEs, WBEs, and minority and female workers.

(11) If a contracting entity has rejected one or more MBEs or WBEs for a subcontracting or joint venture opportunity, providing supportable reasons for rejection based on a thorough investigation of the business and its qualifications.

(12) All other evidence of good faith efforts that the County Executive or his or her designee deems sufficient to advance the County's goals to encourage minority and female participation in County projects.

(f) *Waiver.*

(1) Contracting entities that are unable to achieve utilization and workforce participation goals established for County projects may request a waiver from the County Executive or his or her designee. Waivers will only be granted when all reasonable attempts at good faith efforts have been exhausted.

(2) Good faith effort requirements may be waived on certain County projects due to the inability to appropriately apply the requirements in this section as a result of the nature of the contract or project.

(3) A waiver may be granted at the initiation of a purchase, at the vendor selection phase, or at any time during the term of the project.

(4) The determination to grant or deny a waiver and the duration of the waiver will be at the sole discretion of the County Executive or his or her designee.

(5) A contracting entity that demonstrates unwillingness to make good faith efforts, or that has demonstrated unwillingness to comply with good faith efforts in past County projects, will not be eligible for a waiver.

(g) *Compliance.*

(1) If the County Executive or his or her designee determines that a contracting entity has not made recent and substantial good faith efforts during the term of a County project, and the contracting entity does not have a valid waiver, the County Executive or his or her designee will notify the contracting entity of its non-compliance in writing. The notice will detail the non-compliance and will include information regarding the actions the contracting entity must take to cure the non-compliance.

(2) The contracting entity will be given ten (10) business days to cure the non-compliance or to provide a response in writing to the County Executive or his or her designee making acceptable arrangements to cure the non-compliance. Acceptable arrangements may include a waiver where the County Executive or his or her designee deems appropriate.

(3) If the contracting entity fails to cure the non-compliance or to make acceptable arrangements to cure the non-compliance within ten (10) business days, or if the County Executive or his or her designee finds the contracting entity's response insufficient, the County Executive or his or her designee may:

a. Cancel, terminate, or suspend the contract in whole or in part;

b. Declare the contracting entity ineligible for further contracts for up to one calendar year;

c. Require the contracting entity to pay liquidated damages in the amount of fifty dollars ($50.00) per day for each day the contracting entity was in non-compliance beginning with the original date of the letter of non-compliance; and/or

d. Pursue other contractual remedies or sanctions allowable by law.

14.6 Affirmative action plan; submittal and approval.

(a) *Submittal.* Each contracting entity, as defined herein, shall submit an affirmative action plan and a utilization plan for the County's consideration describing the actions the entity will take to ensure compliance with this article. Affirmative action plans shall be accepted for a period of one (1) year from the date of approval by the County. Utilization plans must be submitted for each contract unless otherwise determined by the County Executive or his or her designee.

(b) *Minimum requirements.* The plan shall be approved by the County Executive or his or her designee if, and only if, the plan at minimum reflects substantial compliance with the following requirements:

(1) *Equal employment policy statement.* The contracting entity must indicate a positive attitude toward equal employment opportunity and indicate that decisions regarding recruitment, hiring, training and promotion will be made without regard to race, color, religion, national origin, ancestry, sex (including pregnancy), gender identity or expression, age, citizenship status, marital status, sexual orientation, genetic information, order of protection status, arrest record, military status, physical or mental disability unrelated to an individual's ability to perform the essential functions of their job with or without reasonable accommodations, or unfavorable discharge from the military, except when one (1) of these criterion is a good faith qualification for the occupation involved.

(2) *Assignment of responsibility.* The contracting entity must select a director of the contracting entity's affirmative action program. It will be the director's responsibility, among other things, to assist in the identification and solution of problems. The contracting entity must give the director the necessary top management support and staffing to fulfill his or her job duties.

(3) *Procedures for disseminating policy.* A policy of affirmative action is considered to be of little value unless it goes beyond the words on a piece of paper and is put into effect. The contracting entity is responsible for establishing procedures for disseminating their affirmative action program both within the entity (internally) and outside the entity (externally).

(4) *Utilization analysis.* The contracting entity must identify those areas within the contracting entity's workforce in which minorities and women are being under-utilized.

A utilization analysis is composed of four (4) different parts: a workforce analysis; identification of job groups within the contracting entity; an availability analysis; and an under-utilization analysis.

(5) *Goals and timetables.* For each job group in which under-utilization of minorities or women is found, the contracting entity must set up a system of goals and timetables for correcting the deficiencies. Separate goals for minorities and women must be established, but a single goal for minorities is acceptable unless it is determined that one (1) minority is underutilized in a substantially disparate manner.

(6) *Identification of problem areas and adverse effect.* The contracting entity must identify key job titles in which women or minorities are under-represented in relation to their availability in the workforce and those employment practices which have an adverse effect on women or minorities so as to discourage their employment or full utilization. The contracting entity studies of applicant flow, recruitment procedures, selection and placement procedures, promotions and transfers, seniority systems, terminations, relations with labor unions, employee benefits and working conditions are required.

(7) *Corrective action measures.* Should problem areas be identified or a disproportionate impact on women or minorities be uncovered, the contracting entity is obligated to develop and execute corrective action programs. The total selection process should be evaluated and the necessary changes made.

(8) *System for monitoring compliance.* To ensure that the non-discrimination policy is being carried out, the contracting entity should monitor employment actions at all levels and require the submission for review of reports from unit managers on a scheduled basis.

(9) *Support of EEO programs.* The contracting entity must actively support local, state, and national programs that are designed to improve the employment opportunities of women and minorities.

(10) *Recruitment of persons outside workforce.* Racial minorities and women generally considered outside of the workforce should be considered for employment when they have the requisite skills and can be recruited through good faith efforts.

(11) *System of records and annual summary.* In order to be able to supply compliance officers with information on affirmative action efforts, contracting entities should establish a system of compiling support data in such forms as applicant flow data, progression line charts, seniority rosters, and applicant rejection ratios indicating minority and sex status.

(c) *Failure to submit plan.* If the proposed contracting entity fails to submit an affirmative action plan and utilization plan which, in the County Executive's sole discretion, comply with this section, prior to the execution of a contract by the County, or within such reasonable time after execution as may be provided by the County Executive, the sanctions provided for in this article or provided for in the agreement shall be enforced against the contracting entity.

(d) *Failure to cooperate or comply with plan.* If the contracting entity fails to provide information required to the County Executive to determine compliance with the plan within ten (10) business days of any such request, or fails to make a good faith effort to comply with the provisions of the submitted and approved affirmative action plan, or utilization plan the County Executive may invoke any of the sanctions provided for under the terms of the agreement with the contracting entity.

Article 15 - General Savings Clause

15.1 If any Article or provision of this Agreement shall be declared invalid, inoperative or unenforceable by any competent authority of the executive, legislative, judicial or administrative branch of the Federal or State government, the Contractor and the Union shall suspend the operation of such Article and provisions during the period of its invalidity and shall substitute by mutual consent, in its place and stead, an Article or provision which will meet the objections to its validity and which will be in accord with the intent and purpose of the Article or provision in question.

Article 16 - Term of Agreement

16.1 This Agreement shall be in full force as of and from the date shown above to and including the end of all construction by the Contractor.

(Remainder of page intentionally left blank.)

PROJECT NAME AND CONTRACTOR SIGNATURE PAGE

Project Name _____

IN WITNESS WHEREOF, the ECIBCTC and CONTRACTOR have executed this Project Labor Agreement on this _____ day of _____ , 2022.

CONTRACTOR

_____
Contractor Signature

_____
Print Name

_____
Title

_____
Company Name

_____
Address

_____
City, State, Zip Code

_____
Phone

_____
Fax

_____
Email

_____
Website

East Central Illinois Building & Construction Trades Council (ECIBCTC)

_____
ECIBCTC President by resolution and authority of the signatory trade unions of the Project Labor Agreement

Boilermakers LU #60
Bricklayers LU #8
Carpenters LU #243
Electrical Workers LU #601
Elevators LU #55
Glaziers LU# 1168
Heat and Frost Insulators LU #18
Ironworkers LU #380
Laborers LU #703
Laborers LU #751
Millwrights LU #1051
Operating Engineers LU #84l
Painters LU #363
Plasterers & Cement Masons LU #l43
Plumbers & Steamfitters LU #149
Road Sprinklers LU #669
Roofers LU #97
Sheet Metal LU #218
Teamsters LU #26

SIGNATURE PAGE(S) FOR THE UNIONS

(to be supplied by Union)

PARTICIPATION AGREEMENT

The undersigned Project Contractor, Contractor or subcontractor, subcontracting to _____ agrees to be bound to the attached Project Labor Agreement negotiated between _____ and the East Central Illinois Building & Construction Trades Counsel (ECIBCTC).

_____

Project Contractor, Contractor, Subcontractor

_____

By

_____

Date

UNION CONTACT LIST

(to be supplied by Union)

INTERGOVERNMENTAL AGREEMENT
BETWEEN THE CITY OF CHAMPAIGN, ILLINOIS
AND THE COUNTY OF CHAMPAIGN, ILLINOIS
REGARDING TIIE CHAMPAIGN DIVERSITY ADVANCEMENT PROGRAM

This Agreement, by and between the City of Champaign, Illinois, a municipal corporation (hereinafter referred to as “City of Champaign” or “the City”) and the County of Champaign, Illinois, a unit of local county government and a body corporate and politic (hereinafter referred to as “County of Champaign” or “the County”), collectively referred to as the "Parties," is made and entered into in consideration of the mutual promises contained in this Agreement.

WHEREAS, Section 10 of Article VII of the Constitution of the State of Illinois, 1970, and Section 9 of the Intergovernmental Cooperation Act (5 ILCS 220/1-9) provide authority for local governments to contract or otherwise associate among themselves to obtain and share services and exercise, combine or transfer any power or function in any manner not otherwise prohibited by law or ordinance;

WHEREAS, the City has created the Champaign Diversity Advancement Program ("CDAP"), a program intended to foster and increase the utilization of socially disadvantaged and local economically disadvantaged groups in purchasing and contracting with the City;

WHEREAS, as part of CDAP, the City maintains a certified database of qualified contracting entities that are 51 percent owned and operated by females, minorities, or individuals in other socially disadvantaged groups; or that are local, economically disadvantaged businesses;

WHEREAS, the City also provides its own "CDAP Certification" to businesses that qualify as contracting entities that are 51 percent owned and operated by females, minorities, or individuals in other socially disadvantaged groups; or that are local, economically disadvantaged businesses;

WHEREAS, the County wishes to use the City's certified database to further its own efforts to increase utilization of socially disadvantaged and local economically disadvantaged groups in purchasing and contracting with the County;

NOW, THEREFORE, in consideration of all the foregoing and the benefits accruing to the City and the County, by virtue of the execution of this Agreement, the Parties agree to the following:

1. The County will pay an initial one-time sum of five thousand dollars ($5,000.00) to the City for the first year of this agreement.

2. This Agreement shall be effective when signed by the last of the Parties. The Agreement shall renew annually and remain in effect unless terminated by 30 days' written notice by either Party. Any annual renewal costs for services described in this

Agreement will not exceed $5,000.00 per year unless otherwise negotiated by the Parties.

3. The City will share access to its certified database of CDAP-qualifying vendors and contracting entities with the County for the County's use in encouraging diversity and inclusion in public contracting and purchasing. The access will not include administrative functions used by the City to maintain and monitor the software.

4. Any additional features of the City's CDAP program or database the County may request to use will require an analysis of costs and an amendment to the contract to include such costs.

5. The County may publicly market that it recognizes CDAP certification by the City of Champaign in its own diversity in purchasing initiatives and communications.

6. The County may state in its Invitations to Bid, Requests for Proposals, and other solicitation and contract documents that it recognizes CDAP certification by the City of Champaign as evidence that a business is qualified as a contracting entity that is 51 percent owned and operated by females, minorities, or individuals in other socially disadvantaged groups; or is a local, economically disadvantaged business.

7. No amendment to this Agreement shall be effective unless it is in writing and signed by the Parties.

IN WITNESS WHEREOF, the City of Champaign and the County of Champaign have caused this Agreement to be executed and delivered.

CITY OF CHAMPAIGN, ILLINOIS

BY:_____
City Manager

Date of signature:_____

ATTEST:_____
City Clerk

Approved as to form:

_____
Assistant City Attorney

COUNTY OF CHAMPAIGN, ILLINOIS

BY:_____
County Executive

Date of signature:_____

ATTEST:_____
County Clerk

Approved as to form:

_____
Assistant State's Attorney

Public Parking